IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

VOL. XIV JUNE 1935

SIMMONDS (H. W.) & PARHAM (B. E. V.). **Tomato wilt observations.**—*Agric. J. Fiji*, vii, 1, pp. 21–25, 1934.

After an introductory note by H. W. Simmonds, in which he states that tomato wilt in Fiji is extremely virulent, B. E. V. Parham describes investigations which showed that the commonest form present in the island is due to *Bacterium solanacearum*, though several infections by *Fusarium lycopersici* have recently been observed. Short notes are given on the symptoms of these diseases and the control of the former by seed treatment, soil sterilization, crop rotation, plant sanitation, and the use of resistant varieties.

VANINE (S. I.). Лесная фитопатология. [Forestal phytopathology.]—440 pp., 227 figs., Гослестехиздат [State Forestal Tech. Pub. Office], Leningrad, 1934.

This is a somewhat condensed version of the author's previously published text-books on forest pathology [*R.A.M.*, xiii, p. 405] and the decays of felled and structural timber, which has been officially adopted by the Soviet authorities for use in the Schools of Forestry of the U.S.S.R. The book is well produced and copiously illustrated and should prove a handy and useful text-book for students.

Forest research in India, 1933–1934. Part I. The Forest Research Institute.—92 pp., 1934.

On pp. 24–26 of this report brief notes are given on the progress of the mycological and pathological work under the charge of K. D. Bagchee at the Forest Research Institute, Dehra Dun, India.

On pp. 47–54 an account is given of the work of the wood preservation section under S. Kamesam. The most important achievement during the period under review was the perfecting of the so-called 'ASCU' (arsenic-copper) process [cf. *R.A.M.*, xiv, p. 138]. This is a development of the Falkamesam process [ibid., xiii, p. 284] in which arsenic and copper become fixed in the treated wood, and tests are stated to have shown that a 4 per cent. solution containing 1 part of arsenic to 3 of copper is as effective a wood preservative as undiluted 100 per cent. creosote while costing only about one-sixth as much. An improved and accelerated method of testing wood preservatives has been devised and consists in the use, instead of the ordinary sticks, of rotary-cut veneers,

6 by 1 by $\frac{1}{16}$ in., of a very perishable wood, such as *Bombax malabaricum*, which are treated in an open tank and half-buried in the ground before the onset of the rains.

WELCH (D. S.). **The range and importance of Nectria canker on hardwoods in the northeast.**—*J. For.*, xxxii, 9, pp. 997–1002, 1 fig., 1934.

The most important disease of hardwoods in the north-eastern United States has been found to be the canker caused by *Nectria ditissima* or *galligena* [*R.A.M.*, xiii, p. 732], which was studied by the writer in New York from 1927 to 1933 and in various parts of New England in the latter year. The damage inflicted by the fungus was observed to vary greatly among different stands, in some of which 60 to 80 per cent. of the trees of a particular species may be rendered commercially useless. This occurs, for instance, with red and black oaks [*Quercus rubra* and *Q.* (?) *velutina* Lam.] in Connecticut, yellow and black birch [*Betula lutea* and *B. nigra*] in Vermont, paper birch [*B. alba* var. *papyrifera*] in New Hampshire, and basswood [*Tilia americana*] in New York. The trees are seldom killed outright, the initial lesions being small and extending slowly, often at a rate of under $\frac{1}{2}$ in. per annum. The risk of death by girdling is thus inconsiderable, but the development of an open wound, often directly connected with the heartwood by a dead branch trace, leads to infection by insects and wood-destroying fungi.

Observations showed that abundant fruiting of the *Nectria* on diseased wood in contact with the ground may be expected within a period of 4 to 30 months after cutting. Perithecia containing viable spores have been collected in every month of the year, though their production is most profuse during the spring. Large areas of the trunk may be involved in the saprophytic development of the fungus, which extends for several feet from the canker over the bark. By cutting away the perithecia immediately maturity is reached, three generations of fruiting bodies have been obtained on the same log within 31 months. Comparative morphological and cultural studies and inoculation experiments have shown that the *Nectria* found growing saprophytically is identical with that found sparsely fruiting on active cankers. It is evident, therefore, that the practice of leaving diseased trees on moist ground constitutes a prolific source of infection in adjacent stands.

BEATTIE (R. K.). **Dutch Elm disease found at Norfolk, Virginia.**—*Plant Dis. Reptr.*, xviii, 15, p. 191, 1934. [Mimeographed.]

Further confirmation of the entry into the United States of the agent of Dutch elm disease (*Ceratostomella ulmi*) on imported European burl elm logs for cutting fancy veneer [*R.A.M.*, xiv, p. 203] is furnished by the recent detection of an infected tree near the landing-place for seaborne merchandise at Norfolk, Virginia.

BADOUX (E.). **La rouille corticole du Pin sylvestre à Engelberg.** [The cortical rust of *Pinus sylvestris* at Engelberg.]—*J. for. suisse*, lxxxv, 12, pp. 269–273, 1 pl., 1934.

Attention is drawn to an outbreak of cortical rust, due either to

Peridermium cornui [*Cronartium asclepiadeum*] or *P. pini* [*R.A.M.*, v, p. 197; vi, p. 201; xii, p. 406] on five- to twelve-year-old pines (*Pinus sylvestris*) in a newly afforested area at an altitude of 1,200 m. above sea-level in the Engelberg district of Switzerland. In a stand of 1,288 trees, 137 (11 per cent.) appeared on a recent inspection to be severely attacked, while in 339 (26 per cent.) the rust was confined to the branches. The disease makes rapid progress on young trees in vigorous growth and causes serious damage through the formation of cankers that may eventually girdle and kill the stems and branches. Though one of the alternate hosts, *Vincetoxicum officinale*, of *C. asclepiadeum* is found locally in profusion no rust has been seen on it and it is thus possible that the rust on *P. sylvestris* is *P. pini*, which can infect directly from pine to pine by means of its aecidiospores and is not known to have an alternate host.

LUTZ (L.). **Sur les ferments solubles sécrétés par les champignons Hyménomycetes. Cytolyse de la cellulose.** [On the soluble ferments secreted by Hymenomycetous fungi. Cytolysis of cellulose.]—*C. R. Acad. Sci., Paris*, cxcix, 18, pp. 893–894, 1934.

Continuing his studies on the physiology of the lignicolous Hymenomycetes [*R.A.M.*, x, p. 700], the writer found that the decomposition of cotton fibres by *Stereum purpureum* was marked by the following successive stages: cellulose, erythrocellulose (staining red with iodine), xanthocellulose (staining yellow with iodine), insoluble gums, soluble gums, intermediate products between gums and sugar, cellobiose, and monoses (dextrose and levulose).

DANA (B. F.). **Occurrence of curly top in the Pacific Northwest in 1934.**—*Plant Dis. Reptr.*, xviii, 14, pp. 168–173, 1934. [Mimeographed.]

Attention is drawn to the unprecedented spread of curly top in the Pacific Northwest in 1934, following an exceptionally mild winter. Maximum losses of 100 per cent. were recorded on tomatoes [*R.A.M.*, xiv, p. 202], table beets [ibid., xiii, p. 674], Hubbard squashes, Ames Hybrid cucumbers, and pansies. Cantaloupes were severely affected (up to 50 per cent. loss), mangel and pepper [*Capsicum annuum*] crops were reduced to the extent of 10 per cent., while beans [*Phaseolus vulgaris*] suffered a loss of 5 per cent. The occurrence of the disease for the first time in western Oregon points to the migration of the leafhopper vector [*Eutettix tenella*] from its breeding grounds east of the Cascade Range.

HUNGERFORD (C. W.). **Curly top of vegetables in Idaho.**—*Plant Dis. Reptr.*, xviii, 14, pp. 173–174, 1934. [Mimeographed.]

During 1934 the virulence of curly top surpassed all records at the Idaho Experiment Station, where cucumbers were totally destroyed, tomatoes showed up to 85 per cent. infection, and Great Northern × Robust bean [*Phaseolus vulgaris*] crosses up to 10 per cent. [see preceding abstract]. Cucumbers and tomatoes were also very seriously affected near Lewiston, while cantaloupes and squashes were generally attacked. Sugar beets and beans grown commercially in the Twin Falls area suffered heavy damage, the loss for the former being estimated at 100

and for the latter (Great Northern) at 10 to 20 per cent. The production of canning and garden beans was calculated at only some 60 per cent. of the normal, largely on account of curly top. On tomato and squash plantings the losses amounted to about 75 per cent. The extremely mild preceding winter undoubtedly permitted the survival of abnormally large numbers of the insect vector [*Eutettix tenella*].

PALM (B. T.). **Notiser om sydsvenska actinomycoser.** [Notes on south Swedish actinomycoses.]—*Bot. Notiser, 1934*, 5–6, pp. 449–456, 1934. [English summary.]

The writer describes his field observations in south Sweden on the actinomycoses of sugar beets [*R.A.M.*, xiii, p. 288], crucifers (swedes, turnips, and radishes), carrots, and leeks.

In many cases the 'scab' of beets is little more than an external blemish, but where the pathogen spreads to the lateral roots considerable damage may be caused and ingress afforded to various parasitic fungi. In the localities visited beets are frequently preceded by potatoes, and it is therefore reasonable to infer that the same species of *Actinomyces* (*A. scabies*) may be responsible for the disease in both crops. In swedes and turnips the injuries associated with actinomycosis were generally negligible, but on radishes the symptoms were more conspicuous and a certain amount of actual damage was caused, while secondary infections by *Pythium* (?) *artotrogus* [ibid., xi, pp. 91, 331] and *Rhizoctonia* [*Corticium*] *solani* were not uncommon. The species of *Actinomyces* isolated from diseased radishes was found to be capable of infecting sugar beets. The mild infection detected on the upper parts of carrots, immediately below soil level, is thought to be probably due to the same species.

Of considerable interest as an apparently new record is the occurrence of a definitely chromophorous *Actinomyces* on the peripheral living scales of leeks, purchased in a shop at Lund but possibly of Spanish origin. The sunken, greenish-iridescent, sharply defined lesions, up to 0·5 by 0·2 cm. in diameter, formed a marked contrast to the milky-yellow, healthy tissues. The cells of the diseased areas were found to be completely filled by the slender, sparsely branched, yellow hyphae, 1 to 2 μ in diameter.

DAVIS (W. H.). **Alternaria brassicae as a parasite of Chinese Cabbage.**—*Phytopathology*, xxiv, 12, pp. 1379–1380, 1934.

For the past ten years Chinese cabbage (*Brassica pe-tsai* Bailey) [*B. pekinensis* Rupr.] in Massachusetts has been attacked by a form of *Alternaria brassicae* (Berk.) Sacc. [*A. oleracea*: *R.A.M.*, xiii, p. 3] differing slightly in morphological characters [which are briefly described] from the type species but not sufficiently to justify the establishment of a new species or variety. Common cabbage and cauliflower are also liable to infection by the fungus.

SNYDER (W. C.). **Peronospora viciae and internal proliferation in Pea pods.**—*Phytopathology*, xxiv, 12, pp. 1358–1365, 1 fig., 1934.

A common internal symptom in peas infected by *Peronospora viciae* [*R.A.M.*, xiv, pp. 71, 287] in California is stated to be the presence of white, felty patches of epithelial proliferation directly beneath the

yellowish blotches on the exterior of the pod. The delicate, mat-like growth often involves the greater part of the membranous lining, extends ⅛ in. or more into the cavity, and envelops the ovules. The hair-like outgrowths are several cells long, curling apically and intertwining to produce the dense, felty layer. Immediately below the velvety growth, embedded in the ovary wall, are masses of oospores, the maturation of which imparts a creamy-yellow to brown coloration to the originally white, mealy layer lining the cavity. In pods invaded at an early stage the ovules generally fail to mature, but when they do so the seed coats may be infected by the fungus. The conidial stage of the latter developed on pea plants grown in soil artificially infested with oospores from diseased pods.

WADE (B. L.) & ZAUMEYER (W. J.). **Internal breakdown of Pea seed.** —*Phytopathology*, xxiv, 12, pp. 1384–1386, 1 fig., 1934.

Some 20 per cent. of the Laxtonian pea seed received from Salinas, California, in the spring of 1934 showed spherical, dull light to dark brown lesions, 1 to 5 mm. in diameter, of irregular outline, surrounding the centres. Isolation experiments gave negative results in respect of a pathogenic agent and it is thought that the condition, which was associated with excessive waterings during the ripening period and harvesting in rather cool weather in June, 1933, may be analogous to the 'rotten heart' or 'marsh spot' reported from Holland [and England: *R.A.M.*, xiv, p. 279].

ZAUMEYER (W. J.) & WADE (B. L.). **Physiological spotting of Pea seed.** —*Phytopathology*, xxiv, 12, pp. 1383–1384, 1 fig., 1934.

Attention is drawn to a dark green or nearly black spotting of the seed of Surprise and closely related pea varieties in several American States and in Mexico, resembling that due to *Bacterium pisi* but apparently of purely physiological origin. Both normal and spotted seed may, under certain conditions, produce spotted progeny, and the removal of the blemished seed by hand-picking in some of the canning areas is stated to involve heavy expenditure.

CHRISTOFF (A.). **Einige Versuche über die Bakterienkrankheit bei Bohnen.** [Some experiments on the bacterial disease of Beans.]—*Phytopath. Z.*, vii, 6, pp. 537–544, 2 figs., 1934.

In a test in 1933 on the reaction of five bean [*Phaseolus vulgaris*] varieties to bacterial blight [*Bacterium phaseoli*] in Bulgaria [*R.A.M.*, x, p. 151], severe infection was contracted by the black, white, and yellow sugar-beans and the Mastilen variety, sown between rows of the highly susceptible Flageolet, as well as by the latter itself; only Maitschin proved highly resistant. Further experiments [details of which are given] confirmed the observations of American workers [ibid., vii, p. 430] as to the remedial value of old seed (preferably seven years old), supplemented if necessary by the application of 1 per cent. Bordeaux mixture at the commencement of flowering or on the first signs of infection. Other sanitary practices calculated to ensure the health of the crop are briefly indicated.

TAKIMOTO (S.). **A new anthracnose of Azuki Bean.**—*Ann. phytopath. Soc. Japan*, iv, 1–2, pp. 21–24, 2 figs., 1934.

Azuki beans (*Phaseolus radiatus* var. *aurea*) in the Hukuoka Prefecture, Japan, are stated to suffer from an anthracnose disease, characterized by a reddish-brown spotting of the leaves and attributed to a new species of *Colletotrichum* which is named *C. phaseolorum*. The fungus, which was also found occurring spontaneously on cowpea and was successfully inoculated into kidney beans (*P. vulgaris*), formed black, coriaceous colonies on potato agar and grew best at 30° C., the minimum and maximum temperatures for development being 9° and 36°, respectively. The short conidiophores arise from subepidermal, erumpent acervuli and bear mostly fusiform conidia, 17 to 20 by 3 to 7 μ; the dark brown, uni- to tricellular setae measure 60 to 110 by 3 to 4 μ on *P. radiatus* var. *aurea* and 60 to 120 by 3 to 4 μ on cowpea.

VERPLANCKE (G.). **Étude de propriétés des virus causant les maladies de dégénerescence de la Betterave.** [A study of the properties of the viruses causing Beet degeneration diseases.]—*Sucr. belge*, liv, 7, pp. 118–127; 8, pp. 142–151; 9, pp. 162–168, 1934–5.

The virus responsible for the 'yellowing' disease of sugar beets and *Beta trigyna* in Belgium [*R.A.M.*, xiv, pp. 209, 327] was experimentally shown to be transmissible from infected to healthy plants by juice inoculations. The disorder is, therefore, evidently of virus and not, as has been suggested, of physiological origin.

The author has carried out more detailed studies on beet mosaic. The thermal death point of the virus was found to lie between 90° and 95° C. It was destroyed by one hour's exposure to 94 per cent. ethyl alcohol, half-an-hour's contact with 5 per cent. formol, 1 per cent. carbolic acid [time not stated], 0·5 per cent. copper sulphate instantaneously, 1 per cent. caustic potash [?] instantaneously, mercuric chloride 1 in 2,000 in 48 hours, oxygenated water in a few minutes; nitric acid (1 in 500) and glycerine produced inactivation of the virus. No diminution of virulence followed the admixture, for 30 minutes or 12 hours, of juice from tobacco, privet, *Solanum capsicastrum*, *S. dulcamara*, *Abutilon thompsoni*, *Phytolacca decandra*, *Clivia nobilis*, *Primula obconica*, *Monstera deliciosa*, or *Pelargonium zonale* with that of mosaic beets. The dilution limit for the virus was 1 in 100,000. Undiluted mosaic juice remained virulent for six days at laboratory temperature and for nine at 12° C. Neither these figures nor those for the thermal death point agree with Miss Hoggan's data [ibid., xii, p. 674], and it may reasonably be deduced from the discrepancies that more than one virus is concerned in the production of beet mosaic.

Using a modification of Vinson's and Petre's purification technique and other methods, the writer obtained a filtrate from which all traces of protein were virtually or definitely absent, pointing in his opinion to the non-living nature of the virus and to its origin in abnormal metabolic processes [cf. ibid., xiii, pp. 329, 475, 588]. The virus traversed a collodion filter with pores of a maximum dimension of 0·6 μ. Comparative inoculation tests with mosaic beetroot juice and purified virus solution at various concentrations up to 1 in 100,000 showed that,

judging by the intensity of the symptoms, the latter withstands dilution better than the former. The infectivity of the purified virus reached a maximum about P_H 7·7.

Injected intravenously into rabbits, the mosaic juice, either in its natural state or inactivated by heating, and diluted with water to the extent of 50 per cent., provoked the formation of a specific antigen.

PALO (M. A.) & FAJARDO (T. G.). **Two destructive leaf diseases of Celery in the Philippines.**—*Philipp. J. Agric.*, v, 2, pp. 31–45, 3 pl., 1 graph, 1934.

A summary is given of the writers' observations on the history, distribution, economic importance, prevalence, symptoms, etiology, and control of the late and early blights of celery (*Septoria apii-graveolentis* and *Cercospora apii*, respectively) [*R.A.M.*, xii, pp. 196, 495, *et passim*]. The losses due to late blight in the Philippines have been estimated at 10 to 20 per cent. of the crop, and to early blight at 8 to 10 per cent. The temperature ranges in the Baguio and Manila districts have been found approximately to correspond with those favouring the development of late and early blight, respectively. Satisfactory control of both diseases has been obtained in Trinidad Valley, Mountain Province, by 4–4–50 Bordeaux mixture applied weekly or 5–5–50 at 10- to 14-day intervals.

FOSTER (A. C.). **Blackheart disease of Celery.**—*Plant Dis. Reptr.*, xviii, 14, pp. 177–185, 1934. [Mimeographed.]

Notes are given on the prevalence in the United States and Canada of blackheart of celery, a physiological disturbance apparently due in the first instance to adverse environmental conditions, such as excessive fluctuations in the soil moisture content and over-plentiful manuring. A baffling feature of the disease is that either extreme humidity or drought may result in an outbreak. Blackheart is sometimes confused with the soft rot caused by members of the *Bacillus carotovorus* group [cf. *R.A.M.*, x, p. 125; xiv, p. 142]. The latter, however, causes total decay of the affected parts, usually without hope of recovery, whereas the former, originating in the heart leaves and producing discoloration of the veins and margins, is frequently outgrown. It is possible that the bacterial infection is secondary to blackheart.

RODIGIN (M.). Новые болезни ибахчевых. [New diseases of Cucurbits.]—*На Защиту Урожая* [*Plant Protection*], Moscow, *1934*, 4, pp. 13–15, 2 figs., 1934.

The author reports that in 1930 watermelons in the lower Volga basin were severely attacked by two diseases not previously observed in the region, and presumably introduced with seed from abroad. They were the wilt due to *Fusarium niveum* [*R.A.M.*, xiv, p. 220], which in 1931 caused considerable losses owing to favourable weather conditions, and a black rot of the fruits, caused by an undetermined species of *Fusarium*. This disease starts usually at the calyx end of the developing melons, as faint, dark, rounded, subcuticular spots, which in dry weather

extend both in area and in depth while in wet weather a pink conidial efflorescence develops on their surface; the vegetative organs of the plants were never seen to be attacked by the fungus. American watermelons appeared to be the most susceptible to this fruit rot, local varieties being more or less resistant and the Melitopol variety, an improved strain of the Bykovskaya Cucurbit Cultivation Station, practically immune. Control measures are briefly discussed under each disease.

Since 1931 vegetable marrows [*Cucurbita pepo*] have been increasingly attacked in storage by anthracnose [*Colletotrichum lagenarium*], infection in some cases being as high as 90 per cent. of the stored fruits. This is stated to be the first record in Russia of *C. lagenarium* on this host.

Higgins (B. B.). **Important diseases of Pepper in Georgia.**—*Bull. Ga. Exp. Sta.* 186, 20 pp., 2 col. pl., 6 figs., 1934.

In this bulletin, which is a revised version of the author's previous work on the subject [*R.A.M.*, iii, p. 247], brief, popular notes are given on the symptoms and control of the following diseases of pepper [*Capsicum annuum*] in Georgia: damping-off (*Rhizoctonia* [*Corticium*] *solani*, southern blight (*Sclerotium rolfsii*) [ibid., ix, p. 436], downy mildew (*Peronospora* sp.) [ibid., xiii, p. 602], mosaic, physiological blossom-end rot [ibid., xi, p. 803], internal fruit mould (various mould fungi), leaf spot (*Cercospora capsici*) [ibid., xi, pp. 281, 605], bacterial spot (*Bacterium vesicatorium*) [ibid., iii, p. 119], anthracnose (*Gloeosporium piperatum*) [*Glomerella cingulata*: ibid., xii, p. 724], and ripe rot (*Vermicularia* [*Colletotrichum*] *capsici*) [ibid., x, p. 57; xi, p. 804]. The paper terminates with short, practical recommendations for the control of seed-borne diseases of pepper by means of seed selection and disinfection, sanitation, crop rotation, and spraying.

Hiroe (I.) & Watanabe (N.). **Brachysporiose of plants. III. On a new fruit rot disease of Pepper.**—*Trans. Tottori Soc. agric. Sci.*, v, 1, pp. 36–61, 1 pl., 2 figs., 1934. [Japanese, with English summary.]

A tabulated account is given of the writers' studies on a new fruit rot of chilli pepper (*Capsicum annuum*) in the Tottori district of Japan, characterized by subspherical, circular, or irregular lesions, chestnut-brown at first, turning black later. Four fungi are implicated in the etiology of the rot, namely, *Brachysporium tomato* (Ell. et Barth.) Hiroe and Watanabe n.c. (*Helminthosporium tomato*), also found on tomato fruits, *B. ovoideum* n.sp., *B. senegalense* Speg., and *B. capsici* n.sp., Latin diagnoses being given of the new combination and the two new species. In both the latter the conidiophores are erect, simple, slightly flexuous, light brown, 5- to 10-septate, measuring 50 to 400 by 4 to 9 μ, and bearing single acrogenous conidia. The conidia of *B. ovoideum* are ovoid, straight or curved, 1- to 4-, usually 3-septate, rounded at both ends, 16 to 29 by 10 to 17 μ (mostly 20 to 24 by 10 to 13 μ), yellowish-brown, the outermost locules paler. In *B. capsici* they are oblong-fusoid, generally slightly curved, rounded above and pointed below, 1- to 5-, usually 3- to 4-septate, 12 to 49 by 7·4 to 14·5 μ (mostly 29 to 31 by 10 to 12 μ), the outermost locules pale-coloured, the next brown, and the central brownish-black.

WARE (W. M.). **Plaster moulds in Mushroom beds.**—*Gdnrs' Chron.*, xcvi, 2504, pp. 444–445; 2505, pp. 463–465, 3 figs., 1934.

White plaster mould (*Oospora fimicola*) of the cultivated mushroom [*Psalliota campestris* and *P. arvensis*: *R.A.M.*, xiii, p. 213] is believed to have been first observed in England in 1925, but it was not recorded until 1931 [ibid., xi, p. 94]. Of recent years the disease has been common in Sussex and Wiltshire. In fresh material the spores measure 6 to 10 by 4 to 8 μ and vary in shape from oval to globose-oval or globose. These dimensions correspond with those given by Costantin and Matruchot in France and Cuboni and Megliola in Italy, and cultures of the fungus sent to America were found to be identical with the plaster mould occurring in the United States [*R.A.M.*, xiii, p. 7]. Circumstantial evidence indicates that *O. fimicola* is introduced into mushroom beds with the manure. On the outside or in the interior of the bed the mould presents a white powdery aspect resembling that of scattered plaster or lime, and where the compost is kept dry the spores may rise in the air as a light cloud when disturbed. At an advanced stage of maturity the fungal patches turn faintly pink. Once it has gained an entrance into the beds the mould cannot easily be checked or eradicated.

The brown plaster mould described from the United States [loc. cit.] as due to *Myriococcum praecox* Fr. was shortly afterwards found in various parts of England [see next abstract] forming dense white, later cinnamon-brown patches on the beds. Like the foregoing, it is probably introduced on the manure but it succumbs, according to J. F. Styer (Modern Mushroom Culture, West Chester, 1933), to a temperature above 125° F. which is reached on the completion of filling in houses constructed on the tier system. The agent of brown plaster mould is believed to be *Papulaspora byssina* Hots. (*Bot. Gaz.*, lxiv, p. 271, 1917) [this original spelling of the genus name being preferred to that adopted by Saccardo (*Papulospora*): *R.A.M.*, iii, p. 104; vi, p. 212]. It would appear that this organism (originally described from the United States) is identical with that determined on mushrooms in the United States as *M. praecox*. In the English material the typical bulbils are usually spherical or oval, mostly 50 to 230 by 50 to 180 μ, white or cream-coloured at first, later brown, and composed of hexagonal cells, those on the exterior ranging from 6 to 20 μ in diameter while the inner, hyaline ones measure 10 to 24 μ. The hyaline, septate hyphae are 2 to 5 μ (mostly 4 μ) in diameter. On potato-dextrose agar growth is slow, bulbil formation in a deep, fluffy layer covered with a thin hyphal web beginning after about three weeks at 57° F.

Mushroom diseases. Successive stages in Mushroom cultures. Part 3.—*Mushroom News* (W. Darlington & Sons, Ltd., Worthing, Sussex), i, 9, pp. 4–11, 5 figs., 1934.

Notes are given in popular terms on the following diseases or contaminants of cultivated mushrooms [*Psalliota campestris* and *P. arvensis*] in Great Britain and their control: brown plaster mould (*Myriococcum praecox*) [or *Papulaspora byssina*: see preceding abstract], white plaster mould (*Monilia* [*Oospora*] *fimicola*), olive-green mould (*Chaetomium olivaceum*) [*R.A.M.*, vi, p. 296], inky caps (*Coprinus atramentarius*),

green moulds (*Verticillium* and *Penicillium* spp., a species of the former also causing a greyish spot or blotch of the caps), *Xylaria vaporaria*, 'bubble' (*Mycogone perniciosa*), *Cephalosporium costantinii*, *C. lamellaecola*, *Pseudomonas tolaasii* [ibid., xiii, p. 213], 'rose comb', due to coal, mineral, or paraffin oil fumes, *Dactylium dendroides* [ibid., xii, p. 353], and *Fusarium solani*.

The *Verticillium* causing greyish spotting or blotching of the upper cap surface may also be responsible for severe distortions similar to those produced by *M. perniciosa*. In such cases the stalks are swollen or curved and the cap much reduced, while other common symptoms are the presence on the mushroom of a very fine, white 'bloom' and the downward peeling of parts of the stalk. Attacked mushrooms assume a felt-like consistency and may occasionally show white or greyish, sunken, longitudinal streaks on the stalk and white areas on the gills. The causal organism appears to form only one type of thin-walled spore but is probably capable of persisting under adverse conditions by means of its mycelium.

D. dendroides (also reported from the United States and Canada) forms a white, cottony growth round the individual mushrooms, sometimes completely enveloping and destroying them. The fungus is most prevalent on beds where trash, such as old stem butts, broken mushrooms, and the like, is left lying about, and under these conditions it may cause heavy damage. Spraying the beds with formaldehyde (1 part to 9 of water) may be tested as a control measure.

F. solani (identified by Miss E. M. Wakefield and H. W. Wollenweber) was isolated both from Worthing mushrooms and from material received at the Darlington Laboratory for examination. The latter at first sight presented the aspect of infection by fly larvae, the specimens being stunted and brown (though grown from white spawn); eventually they rotted and died off. The fungus grows upwards from the soil into the mushroom stem, obstructing the passage of water and so causing a brown discoloration and wilting. The spores and mycelium of *F. solani* were found to be completely destroyed by 20 minutes' exposure to a temperature of 138° F., so that the use of properly cured manure, which usually reaches a considerably higher temperature, should prevent its introduction with the manure. Steam sterilization of the casing soil should prove effective in houses where the disease has become prevalent, while all traces of infection may be eliminated by spraying the premises with Darlington's mushroom house disinfectant followed by fumigation with 5 lb. flowers of sulphur per 1,000 cu. ft. of air space. The spores of the fungus were found to survive desiccation in the soil for two months.

RAVAZ (L.). **Chronique. L'excoriose. Le court-noué et son traitement. Le sulfate de zinc.** [Current events. Excoriosis. Court-noué and its control. Zinc sulphate.]—*Prog. agric. vitic.*, cii, 50, pp. 585–590, 1934.

In view of the fresh outbreak of excoriosis (*Phoma flaccida*) [*R.A.M.*, xiii, p. 679] of the vine in France in 1934, which was undoubtedly caused by the rainy spring of that year, the author recommends that special care should be used by the pruners in selecting the branches destined to replace the old wood on affected stocks. A simple method of determin-

ing whether such branches are infected with the fungus is to section one of the lower dormant buds; if healthy, the sectioned living tissues should be of a pure, fresh green colour, while in infected buds brown spots are visible at the periphery and at the base of the scales, though the bud axis may retain its normal green colour. Some observations indicated than in vines emerging from affected buds the fungus may in certain cases progress through the wood, in addition to its normal advance through the cortex. Such vines may be used as fruit-bearing wood, but should be removed the next season. A direct measure of control may possibly be obtained by spraying the affected vines, as soon as the base of the developing new shoots emerges from the surrounding leaves, with a 4 per cent. Bordeaux mixture, in addition to washing the dormant stocks during winter with a 33 per cent. iron sulphate solution, to which one or two litres of sulphuric acid [per 100 l. solution] is added.

The author recommends grafting vines destined for planting in soils subject to court-noué [ibid., xiv, p. 8] on Riparia or Riparia-Berlandieri stocks, which are resistant to the disease and one of which (422A M.G.) appears to have the property of causing the first basal internodes to elongate. Vine-growers are also advised to co-operate in the official tests that are now being made in France of the curative effect on court-noué of zinc sulphate [ibid., xiv, p. 272], by treating their affected vineyards either by an application of 200 to 250 gm. of the substance per stock, or by washing the pruning wounds with a 20 per cent. solution.

ANTONIADES (P.). **Apoplexy or Vine stroke.**—*Cyprus (agric.) J.*, xxix, 4, p. 110, 1934.

In the early summer of 1934, when hot weather set in after a cool, rainy period, the non-parasitic form of vine apoplexy [*R.A.M.*, ix, p. 12; x, p. 78] characterized by the wilting and death of the tips of the shoots and leaves suddenly became more prevalent than usual in Cyprus. The disease, which is induced when the vine gives off more water than the absorption of soil moisture can keep pace with, is sporadic, and frequently occurs on land where the subsoil is damp in spring and the water-table falls rapidly in early summer.

Preventive measures consist in improving drainage, uprooting dead vines, and pruning away the diseased parts of partially affected ones, afterwards painting the wound surfaces with tar.

HUGUES (E.) & BOUFFARD (E.). **Le cuivre dans le jus de Raisin.** [Copper in Grape juice.]—*Progr. agric. vitic.*, cii, 52, pp. 639–640, 1934.

The authors state that out of 50 samples of table grapes from vines sprayed (for the most part copiously) with cupric mixtures only one contained as much as 12 mg. of copper per litre of grape wort, the corresponding figure for over four-fifths of the samples being under 5 mg. [cf. *R.A.M.*, xiv, p. 76].

NOBLE (R. J.). **Australia : notes on plant diseases recorded in New South Wales for the year ending 30th June, 1934.**—*Int. Bull. Pl. Prot.*, ix, 1, pp. 2–5, 1935.

The following records of interest are included in this report. Apples

were attacked by *Schizophyllum commune* causing heart rot [*R.A.M.*, xiii, p. 641] and also suffered from measles [ibid., xiii, pp. 218, 384]. Bananas in newly cleared lands suffered from a dry rot due to *Clitocybe* sp. Strawberries were heavily damaged by a wilt caused by *Rhizoctonia* sp. Serious losses in the tomato crops followed infection by bacterial canker (*Aplanobacter michiganense*) and streak, both new records for New South Wales. A rosette disease of undetermined origin was widespread and destructive among sweet potatoes.

HUMPHREY (H. B.) & WOOD (JESSIE I.). **Diseases of plants in the United States in 1933.**—*Plant Dis. Reptr. Suppl.* 86, 107 pp., 12 graphs, 9 maps, 1935. [Mimeographed.]

This report, prepared on the usual lines [*R.A.M.*, xii, p. 493], contains copious and valuable observations on the diseases of cereal, forage, fruit and nut, vegetable, special, and sugar crops, trees, ornamentals, and miscellaneous plants in the United States during 1933. The hot, dry weather which so greatly favoured the extension of *Aplanobacter stewarti* on maize [see below, p. 354], was adverse to the development of glume blotch of wheat (*Septoria nodorum*) [*R.A.M.*, xiii, p. 177], reported from only seven States; Pennsylvania, however, was exceptional in this respect, the disease being present in every field examined.

Sweet clover [*Melilotus alba*] in Kentucky and elsewhere suffered severe damage from a *Pythium*-like fungus [ibid., xi, p. 429]. Infection appears to occur at the ground line, in the tap-root, and sometimes in new shoots.

Black root of strawberries [ibid., xiv, p. 180] was reported from fifteen States, causing losses up to 50 per cent. and constituting a really serious problem in Massachusetts, Arizona, and Maryland.

Limes, grapefruits, King oranges, and lemons were attacked by scab (*Sphaceloma fawcettii*) [or *Sporotrichum citri*] in Florida [ibid., xii, p. 495], the loss on grapefruits, the most important host, amounting to 5 per cent. Oranges in southern Louisiana and Satsumas [*Citrus nobilis* var. *unshiu*] in Mississippi were infected by the same fungus.

Downy mildew (*Peronospora* sp.) of tobacco [ibid., xiii, p. 602] was much more widespread in Maryland than in the preceding two years.

Puccinia schedonardi was collected on cotton in Oklahoma, this being the first record of rust on that host in the State.

Sheath rot of sugar-cane (*Cytospora sacchari*) [ibid., xiii, p. 728] was reported to have spread rapidly from about 15th May to 1st August at Houma Field Station, Louisiana, retarding or preventing tiller development in susceptible varieties. Among the more promising seedlings undergoing tests for commercial value the incidence of infection ranged from 3 to 38 per cent., with indications of appreciable economic losses under certain conditions in C[anal] P[oint] 28/19 and 29/320. All the commercial varieties were attacked except Co. 290 but never to a larger extent than 5 per cent.

A map facing p. 70 shows the distribution of white pine (*Pinus strobus*) and blister rust (*Cronartium ribicola*) throughout the Union in 1933 [ibid., xiv, p. 220].

Aiding West Virginia agriculture through research.—*Rep. W. Va. agric. Exp. Sta. for the biennium ending June 30, 1934* (*Bull.* 263), 44 pp., 17 figs., 1934.

The following are some items of phytopathological interest in this report, other than those already noticed.

A bark disease of apples, 'black pox', previously regarded as a form of 'measles' [see preceding page and below, p. 372], due to a hitherto unidentified fungus now named *Helminthosporium papulosum*, is of considerable importance in a few restricted localities, and on one occasion was present on fruits of the Grimes variety.

Evidence was obtained that the failure of wilt-resistant watermelon varieties in the Ohio valley was due to the occurrence of strains of *Fusarium niveum* [*R.A.M.*, xiii, p. 143, and above, p. 343] differing in their ability to cause wilting of any particular variety; some strains frequently produced new ones, which also varied in virulence.

Certain red cedar [*Juniperus virginiana*] varieties are naturally resistant to rust [*Gymnosporangium juniperi-virginianae*: ibid., xiii, pp. 311; xiv, p. 150], and grafted trees from rust-free parents when exposed to heavy infection remained unaffected. These resistant types should be suitable for planting in apple-growing areas.

Instant Bordeaux mixture [ibid., xi, p. 587; xii, pp. 240, 654] prepared from pulverized copper sulphate and superfine chemical hydrated lime gave considerably higher suspensions than Bordeaux mixture from stock solutions of copper sulphate and quicklime, which it equalled in toxic properties.

Aamodt (O. S.). **Breeding cereal varieties for northern regions.**—*Proc. fifth Pacif. Sci. Congr., Canada, 1933*, pp. 1729–1739, 5 figs., 1934. [Received February, 1935.]

After stating that fundamental studies on the factors influencing cereal yields are greatly needed and pointing out that in the attempt to improve cereal crops, instead of breeding for such general characteristics as yield and quality it would be more effective to determine the particular characteristics on which yield and quality depend, the author briefly indicates the methods and scope of the cereal breeding work carried out at the University of Alberta, where studies are being made of resistance to cold (with artificial refrigeration) and drought, the milling and baking qualities of different wheats, straw strength and 'shattering', and disease problems. The paper concludes with a plea for better coordination in research work and the setting up of unified objectives, especially in regard to work done for the M.Sc. and Ph.D. degrees of Canadian universities.

Aamodt (O. S.). **The relation between physiologic forms of phytopathogenic fungi and the problem of breeding for resistance to disease.**—*Proc. fifth Pacif. Sci. Congr., Canada, 1933*, pp. 2615–2625, 1934. [Received February, 1935.]

After referring to the importance in plant breeding problems of physiologic specialization in fungi the author discusses with numerous references to the relevant literature the nature of this specialization as

it affects wheat diseases in Canada, and the inheritance in wheat of reaction to infection by the different physiologic forms. Practically all the points dealt with have already been noticed from other sources [cf. *R.A.M.*, xii, pp. 14, 208, 428].

Levine (M. N.) & Stakman (E. C.). **Uniform rust nurseries indicate decreasing severity of stem rust.**—Abs. in *Phytopathology*, xxv, 1, p. 25, 1935.

A consistent decrease in the incidence of stem [black] rust [*Puccinia graminis*: see next abstract] on wheat and oats during the past 15 years is stated to be apparent from observations on uniform rust nurseries in different parts of the United States. Among the factors contributing to this result may be the abnormally low rainfall of the last few years, the eradication of some 20,000,000 barberry bushes [cf. *R.A.M.*, xiv, p. 219], and the increasing use of resistant wheat and oat varieties.

Stakman (E. C.), Hines (L.), Cassell (R. C.), & Levine (M. N.). **Population trends of physiologic forms of Puccinia graminis tritici, 1930 to 1934.**—Abs. in *Phytopathology*, xxv, 1, p. 34, 1935.

Striking changes are stated to have been observed between 1930 and 1934 in the relative prevalence of physiologic forms of *Puccinia graminis* on wheat in Mexico and the United States [*R.A.M.*, xii, p. 427; xiii, p. 753]. Form 56, for instance, constituting only 0·2 per cent. of all rust collections in 1930, was present in over 30 per cent. in 1934, the corresponding figures for form 34 being 0·7 and 20 per cent., respectively. A gradual increase of form 139 also appears to be taking place. On the other hand, the prevalence of form 38 declined from an average of 34 per cent. for 1930–33 to under 4 per cent. in 1934. It is considered significant that the ratios of forms to isolations in 1934 were about 1:3 and 1:33, respectively, for the 29 aecidial and 700 uredo collections tested.

Ramsbottom (J.). **L. G. Windt and heteroecism.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 128–138, 1935.

In this paper the author gives excerpts from a book by L. G. Windt which was published in Germany in 1804, and which appears to be very rare, since he could trace only one copy of it (in the British Museum) in Great Britain, and since the only reference to it in readily accessible works is in Klebahn's *Die wirtswechselnden Rostpilze*, pp. 210–13. The book gives a detailed account, in the form of a diary, of Windt's observations and researches which contributed in a large measure to establish the part played by barberry in the perpetuation and distribution in Germany of black rust of cereals (*Puccinia graminis*).

Young (P. A.). **A new variety of Tilletia tritici in Montana.**—Abs. in *Phytopathology*, xxv, 1, p. 40, 1935.

Three years' investigation of a form of bunt affecting 25 to 95 (average 49) per cent. of the heads in a 200-acre stand of untreated Turkey wheat in Montana in 1931 showed it to be a new variety of *Tilletia tritici*, characterized by conspicuously reticulate chlamydospores, 13 to 18 μ in diameter, which rarely germinate in water at 12° or 25° C. Most of the bunt balls were of a hard, solid consistency instead

of soft and powdery as usual. The diseased plants were very much dwarfed and tillered with abnormal profusion. Soil infestation with the new form [*R.A.M.*, xii, p. 429] caused 0·2 to 4·9 per cent. of infection in three winter wheat varieties, while seed inoculation produced nearly 1 per cent. in five others.

Bockmann (H.). **Bekämpfung der Weizenfusskrankheiten.** [Control of the Wheat foot rots.]—*Dtsch. landw. Pr.*, lxi, 50, pp. 615–616, 1934.

In the Kiel district of Germany the blackleg form of foot rot of wheat, due to *Ophiobolus graminis*, occurs chiefly on soils of moderate or poor quality, following barley and to a lesser extent wheat and rye. It may be lessened by appropriate crop rotation, liberal applications of humus to the soil in the form of organic (not mineral) manure, deep ploughing to induce 'mellowness' and promote the movement of soil moisture, and late sowing. Lodging of wheat, due to *Cercosporella herpotrichoides* [*R.A.M.*, xiv, p. 230], predominates on good soils, following stubble fallow, peas, vetches, and beans [*Vicia faba*], and to a lesser extent clover with summer fallow. It can be checked by measures tending to prevent over-luxuriant autumn growth, e.g., a sparing use of organic material, stable manure being preferably applied to the preceding crop rather than to the wheat itself, and late sowing.

Weigert (J.) & Weizel (H.). **Ertrags- und Güteminderung bei Getreide durch Fusskrankheiten.** [Yield and quality depreciation in cereals through foot rots.]—*Prakt. Bl. Pflanzenb.*, xii, 10, pp. 289–303, 7 figs., 1935.

The writer's continued investigations [the results of which are fully tabulated and described] on the effects of the foot rots caused by *Ophiobolus graminis*, *Cercosporella* [*herpotrichoides*: see preceding abstract], and *Fusarium* spp. on cereals in Bavaria [*R.A.M.*, xiii, p. 432] generally confirmed those previously obtained in respect of the deleterious influence of a preceding wheat or barley crop on the incidence of infection, whereas potatoes, lucerne, oats, field beans [*Vicia faba*], and flax reduced the disease. Spring wheat was if anything more severely affected than the autumn sowings. Under otherwise identical conditions *O. graminis* was much less prevalent on wheat growing in a considerable depth of black earth than on that in shallow vegetable mould. The detrimental effects of the foot rots on tillering, haulm development, and ear formation were clearly shown and are statistically evaluated.

Åkerman (Å.), Granhall (I.), & Hagander (H.). **Undersökningar över olika förfrukters inverkan a Veteskörden, särskilt med hänsyn till angrep av rotdödare (Ophiobolus graminis).** [Investigations on the influence of different preceding crops on the Wheat harvest, especially with reference to the attack of the root-killer (*Ophiobolus graminis*).]—*Sverig. Utsädesfören. Tidskr.*, xliv, *1934*, 6, pp. 386–408, 1935. [German summary.]

A series of experiments was conducted at Svalöf from 1928 to 1934 to determine the influence of different preceding crops on the size and

quality of the wheat harvest, with special reference to the incidence of foot rot caused by *Ophiobolus graminis*, *O. herpotrichus*, and *Hendersonia herpotricha* [*R.A.M.*, xiii, p. 297, and preceding abstracts], of which the first-named appears to be the most injurious in Sweden.

Winter wheat (Svalöfs Kronen) was planted every other year alternating in different plots with Victory and Gopher oats, Gold and Brio barley, Donnerstag peas, a green fodder mixture, and fallow. The best yield was given in the two last-mentioned series; wheat following peas yielded rather less and that following oats and barley was the worst. In the three years in which *O. graminis* was a limiting factor in production, a higher yield, more straw, and superior quality of grain was obtained from wheat following oats than where barley was the forerunner. Precipitation and temperature relations were found to exert a marked effect on the incidence of foot rot, which occurred in a virulent form (1927 to 1929, inclusive) following an abnormally heavy rainfall in May and June; on the other hand, the disease has been virtually absent in the last few, exceptionally dry seasons. The stimulating influence of insufficiently rotted stable manure on the development of *O. graminis* was clearly demonstrated in 1933. Some experiments to determine whether there were any well-marked differences in resistance to the diseases amongst different wheat varieties gave negative results.

Moore (M. B.) & Allison (C. C.). **The distribution of intermediate types of Barley smuts.**—Abs. in *Phytopathology*, xxv, 1, p. 28, 1935.

Seed from some 700 samples of Minnesota barley and 125 from other States was sown in 1934, and the smutted heads, appearing in about half the plots, were examined for head type and colour of spore mass. The character of the spore wall and type of chlamydospore germination were also determined. Smutted heads collected in barley fields were similarly inspected. It was found that, besides *Ustilago hordei* and *U. nuda*, *U. medians* is widespread from North Carolina to Colorado and from Missouri to Minnesota. More than one kind of smut often occurred in the same sample, occasionally two in the same head. *U. nuda* and *U. medians* were not differentiable by head type or colour of spore mass. The heads infected by *U. nuda* fell into at least two colour groups.

Allison (C. C.). **Hybridization between Ustilago hordei and U. medians.**—Abs. in *Phytopathology*, xxv, 1, p. 5, 1935.

Intra- and interspecific combinations of monosporidial lines of *Ustilago hordei* [*R.A.M.*, xiii, p. 691] and *U. medians* [see preceding abstract] were tested on six barley varieties. The pathogenicity of the crosses was similar to that of one or other of the parents, except on the Peatland variety (no smut as compared with 9 per cent. for combined lines of *U. medians*). All the F_2 dicaryophytes resulting from four combinations of F_1 monosporidial lines of a *U. hordei* × *U. medians* cross were distinct in their pathogenicity to the six barley varieties. Two were more pathogenic to Velvet than the F_1 dicaryophytes or either of the intraspecific combinations. In the F_1 the head type was intermediate and the chlamydospores echinulate. In the F_2 segregation occurred for compact, loose, and intermediate head types and for smooth and echinulate chlamydospores. Indications were also obtained of the independent

segregation of the factors governing sex, pathogenicity, head type, and chlamydospore wall characters.

Moore (M. B.) & Allison (C. C.). **An albino strain of Barley smut.**—Abs. in *Phytopathology*, xxv, 1, pp. 27–28, 1935.

In the summer of 1934 a single barley head infected by a strain of *Ustilago hordei* of albino appearance was detected at University Farm, St. Paul, Minnesota. The head was almost white and presented an aspect intermediate between that of loose and covered smut. The hyaline spores were smooth, rather smaller than those of typical *U. hordei*, and produced promycelia and sporidia on germination. Sporidial fusions between monosporidial lines indicate the occurrence of two sex groups in the albino strain that are compatible with those of normal *U. hordei* and *U. medians* [see preceding abstracts].

Christensen (J. J.) & Graham (T. W.). **Physiologic specialization and variation in Helminthosporium gramineum Rab.**—*Tech. Bull. Minn. agric. Exp. Sta.* 95, 40 pp., 11 figs., 6 graphs, 1934.

In a detailed study of several hundred monospore isolations of *Helminthosporium gramineum* obtained from the United States, Canada, and Germany over 125 races were distinguished in culture by the nature, amount, and colour of the mycelium, production of pigments in the substratum, zonation, tendency to produce 'patch' variants, and rate of growth. Races similar to each other on one medium sometimes differed completely on another. Association with bacteria stimulated growth and induced pigment production in certain races only; the staling products of the bacteria exerted differential effects on mycelial development among the races. The races varied in their tolerance to ultra-violet rays, exposure to which failed to stimulate fructification or induce the production of variants. Some were stable, others very unstable. The evidence indicated that certain races may produce variants on the living host, the conidial progeny obtained from a barley plant inoculated with one race falling into ten cultural groups. There were, as between the various races, significant differences in the length, width, and number of septa of the conidia and profound differences in virulence. In general, Svansota, Manchuria, Minsturdi, Peatland, and Velvet were the most susceptible of the barley varieties tested, but none was completely susceptible to every race. Lion, Glabron, and Wisconsin No. 38 were moderately resistant, and Black Hull-less, Spartan and Trebi more so. As certain races are relatively innocuous to certain varieties of barley while very pathogenic to others, much caution is necessary in drawing final conclusions from varietal resistance tests.

Murphy (H. C.). **Effect of crown rust on yield, water economy, and composition of Oats.**—Abs. in *Phytopathology*, xxv, 1, pp. 28–29, 1935.

Crown rust of oats [*Puccinia lolii*: *R.A.M.*, xiv, p. 220], initiated in the seedling and boot stages [in Iowa], entirely suppressed grain production in the susceptible Markton variety and reduced the yield of the resistant Victoria by 47·5 and 30·8 per cent., respectively. Anthesis-stage infection reduced the Markton and Victoria yields by

45·3 and 18·3 per cent., respectively. No appreciable reduction followed attack at the late dough stage. Green, diseased plants of Markton, Iogold (susceptible), Victoria, and Bond (nearly immune) showed an increase in percentage content of insoluble solids, soluble and insoluble ash and nitrogen, and acid-hydrolysable substances, and a decrease in soluble solids, sucrose, glucose, levulose (94·7 per cent. in Markton), and dextrin.

Ivanoff (S. S.). **Inoculation tests with Phytomonas stewarti and P. vasculara.**—Abs. in *Phytopathology*, xxv, 1, p. 21, 1935.

Young sorghum plants inoculated in the greenhouse through basal punctures with *Phytomonas* [*Aplanobacter*] *stewarti* [*R.A.M.*, xiv, p. 160], developed red stripes along the leaf veins similar to those produced by the same pathogen on maize. Field inoculations on sorghum caused reddening and plugging of the vascular bundles, with occasional formation of pith-like cavities. Red leaf stripes developed on Sudan grass (*Holcus sudanensis*) [*Andropogon sorghum* var. *sudanensis*] inoculated in the field. On yellow foxtail (*Setaria glauca*) the stripes resulting from inoculation with *Aplanobacter stewarti* were narrow and tan-coloured.

Maize (sweet corn) plants inoculated at the base in the greenhouse with *P. vasculara* [*Bacterium vascularum*] developed symptoms resembling those induced in the same host by *A. stewarti*, such as water-soaked stripes on the leaves, stalk rot, and general stunting. Puncture inoculations of sorghum plants with *Bact. vascularum* produced foliar symptoms comparable to those associated with this organism on sugarcane and with *A. stewarti* on sorghum.

Ivanoff (S. S.) & Riker (A. J.). **Resistance of Sweet Corn to bacterial wilt.**—Abs. in *Phytopathology*, xxv, 1, pp. 21–22, 1935.

During the summers of 1933 and 1934 tests of resistance to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti* [see preceding abstract] were conducted on over 200,000 maize (sweet corn) plants, including some 2,000 Golden Bantam inbreds and hybrids [*R.A.M.*, xiv, p. 151]. The scope of the experiments and the uniformity and efficiency of inoculation with five pathogenic strains of the organism were greatly enhanced by the use of a plant inoculator [ibid., xiii, p. 390]. No immune plants were found but there were considerable differences in susceptibility, resistance being apparently correlated with both innate and acquired vigour, time of maturation, and 'true resistance'. In general, late strains were more resistant than early ones, but true resistance was found in both weak and vigorous, early and late strains. Crosses between susceptible and susceptible inbreds commonly yielded susceptible hybrids, whereas those between susceptible or resistant and resistant inbreds gave resistant hybrids.

Garber (R. J.) & Hoover (M. M.). **Influence of Corn smut and hail damage on the yield of certain first-generation hybrids between synthetic varieties.**—*J. Amer. Soc. Agron.*, xxvii, 1, pp. 38–45, 1935.

Statistics for 1932–3 are presented supporting the conclusions of previous experiments in West Virginia as to the reduction in maize yields associated with sterility induced by smut (*Ustilago zeae*) [*R.A.M.*,

vii, p. 780; xii, p. 365 and next abstract]. Early-maturing varieties appeared to be more susceptible to this form of injury than late ones. Contrary to expectation, the smut boils situated above the ear and at the neck caused more damage than those below the ear at the base [cf. ibid., xi, p. 447].

Stakman (E. C.), Tyler (L. J.), Hafstad (G. E.), & Sharvelle (E. G.). **Experiments on physiologic specialization and nature of variation in Ustilago zeae.**—Abs. in *Phytopathology*, xxv, 1, p. 34, 1935.

Physiologic specialization appears from the results of three years' inoculation experiments with ten collections of *Ustilago zeae* on six maize varieties to be relatively unimportant from the standpoint of breeding for resistance to smut [*R.A.M.*, xii, p. 365]. Sectoring did not generally decrease to any extent even in lines derived from the thirteenth successive sporidium and did not appear to result from delayed segregation [ibid., xiii, p. 226]. The genotypical determination of sectoring is shown by the fact that segregation, cultural and sexual, on a promycelium was of the 1, 2; 3, 4 type, and in 89 colonies of 49 monosporidial lines from sporidia 3 and 4 there were 360 sectors, while none developed in about the same number of colonies from sporidial lines 1 and 2. There were eight types of segregation in eleven chlamydospores from a certain cross, including three that apparently remained diploid.

Koehler (B.). **Pathologic significance of seed-coat injury in Dent Corn.** —Abs. in *Phytopathology*, xxv, 1, p. 24, 1935.

A slight puncture in the seed coat at the crown caused a 12 to 16 per cent. loss in the grain yield of maize plants [in Illinois], while a corresponding reduction of 18 to 23 per cent. followed the removal of the seed coat from the whole crown. Field inoculation tests showed that, under wet soil conditions, *Aspergillus flavus* and *A. tamarii* [*R.A.M.*, xii, p. 47] caused heavy damage to maize with seed coats injured at the crown, producing virescent seedlings, many of which died from chlorophyll deficiency. *Gibberella saubinetii* proved virulent only in dry soils, notably in plots planted with seed injured at the crown. *Penicillium oxalicum* [ibid., xiii, p. 572] was also much more active in both wet and dry soils on injured than on sound seed-grain. A seed treatment with ethyl mercury phosphate [ibid., xiii, p. 157] practically prevented all reduction in stand or yield from seed coat injury.

Johann (Helen). **Diplodia macrospora on Corn in Brazil.**—*Plant Dis. Reptr.*, xix, 1, pp. 9–10, 1935. [Mimeographed.]

The occurrence of *Diplodia macrospora* [*R.A.M.*, xiii, p. 746] on the rotted kernels of an unnamed white maize variety in San Paulo, Brazil, is briefly reported.

Okabe (N.). **Bacterial diseases of plants occurring in Formosa. IV.**— *J. Soc. trop. Agric. Taiwan*, vi, pp. 54–63, 3 figs., 1934.

Italian millet (*Setaria italica*) in Formosa is liable to a disease termed bacterial brown stripe, characterized by the presence on the leaves of long, narrow, dark or clove-brown streaks, 0·2 to 0·7 mm. in length, sometimes confluent, mostly on the lower side of the midrib, extending

in severe cases to the leaf sheath, occasionally accompanied by a malodorous top rot of the central shoot, and rarely involving the young stalks.

Full details are given of the cultural, morphological, and physiological characters of the causal organism, to which the name of *Bacterium setariae* n.sp. is given. It is a Gram-negative, non-acid-fast rod with rounded ends, occurring singly, in pairs, or in short chains, 1·8 to 4·4 by 0·4 to 0·8 μ in diameter, uni- or occasionally biflagellate, forming white, opalescent, circular, convex, smooth, glistening colonies on beef extract agar, slowly liquefying gelatine and clearing milk, producing indol and ammonia, strongly reducing nitrates, forming acid from dextrose, galactose, and glycerine, and growing moderately well in Uschinsky's, Fermi's, and Fraenkel's solutions; the minimum, optimum, and maximum temperatures for development are above 5°, 31° to 34°, and 42° C., respectively, and the thermal death point 55° to 56°; vitality is retained for over four months in culture and five days' desiccation resisted. The organism was shown by inoculation experiments to be pathogenic to *S. italica* and less severely to oats, wheat, and maize (very mild).

Scurti (F.) & Pavarino (G. L.). **Sopra le erosioni ocracee che compaiono sulla buccia delle Arance sanguine refrigerate. (Contributo allo studio della cosidetta oleocellosi.)** [On the ochraceous lesions appearing on the skin of blood Oranges in cold storage. (A contribution to the study of the so-called oleocellosis).]—*Ann. Sper. agr.*, xv, pp. 7–13, 2 col. pl., 1934.

After stating that blood oranges (*Citrus aurantium sanguineum*) constitute 10 per cent. of the total exports of oranges from Italy the author describes an experiment in which sterilized and unsterilized blood oranges in different types of containers were placed in storage at 4° to 5° C. After fifteen days a high percentage showed a condition resembling oleocellosis [*R.A.M.*, ix, p. 450; xiv, p. 234], ochraceous-yellow, later dark spots appearing on the skin round the calyx and gradually spreading, affecting the epicarp and sometimes the mesocarp beneath. Further examination indicated that the condition was due to the cold storage interfering with the liberation of the essential oil, the low temperature preventing it from volatilizing, with the result that, as the skin lost its elasticity owing to the cold, the essential oil exuded through ruptures into the surrounding tissues, which it corroded. Fruit placed in ordinary storage after being picked in cold, wet weather is liable to a less severe form of the same condition.

Pavarino (G. L.). **Batteriosi delle erosioni ocracee delle Arance ovali.** [Bacteriosis of the ochraceous lesions on oval Oranges.]—*Ann. Sper. agr.*, xv, pp. 15–17, 2 col. pl., 1934.

After pointing out that ordinary oval oranges subjected to cold storage are also liable to develop, though to a less extent, the ochraceous-yellow spotting observed on blood oranges [see preceding abstract], the author states that bacteria enter the spots, penetrate to the oil glands, and increase the alteration of the tissues. The organism most commonly present was identified as *Bacillus mesentericus vulgatus* [*R.A.M.*, xii, p. 109].

Bunting (G.), Georgi (C. D. V.), & Milsum (J. N.). **The Oil Palm in Malaya.**—ix+293 pp., 36 pl., 2 graphs, 4 plans, Department of Agriculture S.S. and F.M.S. (Malayan Planting Manual No. 1), 1934.

This well-produced and copiously illustrated book replaces the bulletin on *Elaeis guineensis* published under the same title in 1927 [cf. *R.A.M.*, vii, p. 164], and is the first of a new series of Malayan planting manuals. In the chapter on oil palm pests and diseases, the mycological part of which (pp. 57–71) is by A. Thompson, notes are given on the symptoms and control of stem rot (*Fomes noxius*) [ibid., xiii, p. 215], *F. lignosus* [ibid., xi, p. 769], bacterial bud rot [ibid., xii, p. 354], crown disease [loc. cit.], and the fruit bunch disease caused by *Marasmius palmivorus* [ibid., xii, p. 355]. Reference is also made to a bunch-end rot and a fruit rot, probably both of physiological origin [cf. ibid., xiv, p. 31], to stem-base rot associated with *Ustulina zonata*, and to lightning injury.

Maublanc (A.) & Roger (L.). **La phthiriose du Caféier au Cameroun.** [Phthiriosis of Coffee in the Cameroons.]—*Rev. Bot. appl.*, xv, 161, pp. 25–32, 1 fig., 1935.

The authors describe in some detail the points of similarity between the specimens labelled *Polyporus coffeae* Wakef. on coffee roots received by them [*R.A.M.*, xiv, p. 333] from the Cameroons and that of vine roots affected with phthiriosis associated with *Bornetina corium* and a coccid in Palestine [ibid., xiii, p. 506], with particular reference to the close morphological resemblance of the conidia of the fungi in both cases. All the evidence indicates that the Cameroon coffee fungus is not parasitic on the roots but develops on the exuded sap resulting from the insect punctures and on the sugary excreta of the latter, forming impermeable, rubber-like sheaths around the roots which are thus asphyxiated. The condition is stated to be especially prevalent in the Dschang region, where it causes serious losses. The genetic connexion between the conidia which Miss Wakefield considered to belong to *P. coffeae* and the sporophores of the latter has never been proved, and the authors consider it to be doubtful. They, therefore, refer this form to the genus *Bornetina*, leaving the question of its specific identity with *B. corium* provisionally open. Like the *Polyporus* it is doubtless a saprophyte.

Progress Reports from Experiment Stations, season 1933-1934.—viii+152 pp., 24 graphs, 1 plan, London, Empire Cotton Growing Corporation, 1935.

This compilation of reports for 1933 from the various stations of the Empire Cotton Growing Corporation [cf. *R.A.M.*, xiii, p. 368] contains the following items of phytopathological interest, apart from those already noticed from other sources [ibid., xiv, pp. 96–98].

Experiments at Barberton, South Africa, on the insect transmission of internal boll disease (*Nematospora gossypii* and *N. coryli*) showed that sterile, freely punctured bolls exposed to 2nd and 3rd instar nymphs of *Dysdercus nigrofasciatus* developed no disease, though others exposed to 4th and 5th instar nymphs became heavily infected. The percentage

amount of staining by each fungus found at maturity was high in bolls artificially inoculated when one to three weeks old, but rapidly declined as the age of the boll at the time of inoculation increased up to seven weeks, after which period it remained low. The loss in weight of lint due to disease declined similarly with the age of the boll at inoculation. Bolls inoculated before three or four weeks old represented a total loss. In Southern Rhodesia (Gatooma) as the season advanced puncturing and staining increased with increase in the stainer population (*D. superstitiosus*, *D. fasciatus*, and *D. intermedius*). The increased damage in the later part of the mature crop demonstrated the importance of early cropping. In Northern Rhodesia, when cotton plots were planted at various distances from areas where stainer host plants other than cotton occurred, one plot in close proximity to such areas became heavily stained, a second, about four miles distant from other hosts, was slightly stained, a third, three miles distant, showed no staining, although stainers were present, the insects probably having arrived too late to cause any damage, while in the fourth, four miles from any known host and entirely surrounded by *Isoberlinia* bush, no stainers were noted and the crop was clean.

Further attempts in the Gezira area, Sudan, to discover an Egyptian-type plant immune from blackarm (*Bacterium malvacearum*) were unsuccessful. A selection (N.T. 3/33) from Sakel resistant to leaf curl showed great purity for a characteristic vegetative habit and high yield. Two plots of a blackarm-resistant American-type cotton obtained from Uganda remained practically immune when sprayed with a suspension of *Bact. malvacearum*, this characteristic being retained in the following season. The propagation of the leaf curl resistant X 1530 [ibid., xiii, p. 369] was continued, some 770 acres being grown in the northern, central, and southern Gezira; though the seed was treated with abavit B serious blackarm developed during the early stages of growth. In a preliminary varietal test of yield, X 1530 and X 1730 appeared to be the types least affected by the Gezira form of 'wilt', which was severe locally.

In breeding tests in Bukalasa, Uganda, re-selections from the B. 31 group of strains continued to show very high resistance to angular leaf spot [*Bact. malvacearum*] and early blackarm, but appeared to be very susceptible to the *Fusarium* wilt [ibid., xiv, p. 82], which developed to a really serious extent. The yield of B. 31 was very disappointing. The most promising group for this area consisted of new selections from B. 37 families, which, though not very resistant to blackarm, appeared to tolerate it, and yielded well. A variety trial at Serere provided striking evidence that the U4/4/2 derivatives possess a resistance to blackarm which places them in an entirely different class from the Local cotton.

Kulkarni (G. S.). **Studies in the wilt disease of Cotton in the Bombay Presidency.**—*Indian J. agric. Sci.*, iv, 6, pp. 976–1048, 9 pl., 4 graphs, 1934.

This is a full tabulated account of the results of laboratory, greenhouse, and field studies carried out from 1923 to 1933 at the Cotton Research Station, Dharwar [*R.A.M.*, xii, p. 566], in the investigation of cotton wilt (*Fusarium vasinfectum*) in the Bombay-Karnatak region,

with particular reference to the biology of the fungus. Nutrition studies in pure culture indicated the improbability that any marked decrease in the field incidence of the disease could result from soil treatment with the various chemical fertilizers that were tested. There also was good evidence that variations in the kind, moisture, and reaction of the soil are of small value from the standpoint of control, but heavy applications (40 tons per acre) of farmyard manure appeared to have a controlling effect in the later developmental stages of the crop. Temperature studies showed that *F. vasinfectum* can tolerate a wide range from 20° to 40° C. with an optimum at about 28° and a thermal death point beyond 50°, but controlled experiments indicated that the disease is severe at soil temperatures between 20° and 27°, decreases at 28° to 31°, and is completely inhibited at 32° and above. As the fungus occurs fairly deeply (up to 20 inches) in the soil, and the soil temperature below six inches does not rise locally above an average of 32°, it follows that once introduced it can remain viable in the soil for a number of years; in some cases it was found to survive for seven years in soil kept free from susceptible varieties of cotton.

While further experiments based on the results of the investigation, including cultivation during the hot season, sowing on ridges instead of on flat land as usually practised, and earlier sowing did not give satisfactory results, the correlation between soil temperature and development of the disease is considered to be an important step in the solution of the preliminary questions concerning the influence of the environment on the occurrence of wilt. It has also been utilized in evolving a special technique for the breeding of wilt-resistant cottons which affords considerable economy in time and expense; this consists in growing plants in pot culture under optimum conditions for disease development for two months, and transferring the survivors to the field for propagation.

The paper terminates with a few recommendations for further investigations, such as the study of the physiologic specialization of the cotton wilt *Fusarium* and of the inheritance of disease resistance in the host. Preliminary experiments at Dharwar suggest that all the Indian cottons may be classed in the two groups, susceptible and resistant, for though certain intermediates exhibiting various degrees of resistance occur, it was shown that the partial resistance of these intermediates in the field is due to environment and not to heredity.

LIKHITE (V. N.) & KULKARNI (V. G.). **Relative parasitism of the Cotton root-rot organisms from Gujrat soils.**—*Curr. Sci.*, iii, 6, pp. 252–254, 1 fig., 1 graph, 1934.

Of the three organisms which were found to stand in causal relationship to cotton root rot in Baroda [*R.A.M.*, xiii, p. 697], the form of *Fusarium vasinfectum* isolated from 'gorat' soils is stated to have been shown to be non-pathogenic to cotton, presumably owing to its having been exposed to the action of such soils for two consecutive generations, since a fresh strain of the fungus obtained from a locality where cotton wilt exists gave a high percentage of infection. There was also evidence that the presence of the Baroda form of *F. vasinfectum* in affected

cotton plants was due to its general symbiotic association with nematodes.

Observations (later confirmed by controlled experiments) in 1931–2 showed that in cotton sown in May and irrigated seven times with well water (with a P_H value of 8) the percentage incidence of root rot associated with *Macrophomina* [*phaseoli*] and nematodes was 92, as compared with 28 to 58 per cent. in cotton sown during the monsoon season after the first showers; a study of the meteorological data for the period involved indicated that a soil moisture of 30 per cent. and a temperature of 40° C. favoured parasitism in *M. phaseoli* and nematodes jointly, but that as soon as these conditions disappear both organisms tend towards saprophytism in the soil.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **The quality of lint and seed from Cotton plants with Phymatotrichum root rot.**—*Phytopathology*, xxv, 1, pp. 104–113, 1935.

Data are presented in tabular form and discussed indicating that root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xiv, p. 304] appreciably affects the quality of lint and seed from Startex cotton plants in Texas, the damage being directly proportional to the earliness of the attack.

STROMAN (G. N.), TAUBENHAUS (J. J.), & EZEKIEL (W. N.). **Some effects of Phymatotrichum root rot on the microscopic characters of Cotton fibers.**—*Phytopathology*, xxv, 1, pp. 126–130, 1935.

The results [which are tabulated and discussed] of a microscopical examination of the fibres from Startex cotton plants killed by root rot (*Phymatotrichum omnivorum*) in Texas in 1931 [see preceding abstract] showed that those from individuals destroyed early in the season were abnormally wide and thick, with fewer convolutions per unit length than healthy material. The fibres from plants killed at a later stage of development did not differ appreciably from those of normal plants. The coarser, less twisted fibres from the plants killed in the early summer constituted less than 10 per cent. of the cotton harvested from plants grown under irrigation in the trials described, and would probably average not more than 20 per cent. of the crop from plants succumbing to root rot under dry-farming conditions.

DRECHSLER (C.). **Some conidial Phycomycetes destructive to terricolous Amoebae.**—*Mycologia*, xxvii, 1, pp. 6–40, 7 pl., 1935.

Three new genera of Phycomycetes capturing and destroying *Amoeba terricola* Greeff [*R.A.M.*, xii, p. 761] are fully described with Latin diagnoses, viz., *Endocochlus* (represented by *E. asteroides* n.sp.), *Bdellospora* (*B. helicoides* n.sp.), and *Zoopage* (*Z. phanera* n.sp.). A fourth genus, *Cochlonema* (*C. verrucosum* and *C. dolichosporum* n.spp.), similarly attacks *A. sphaeronucleolus* and another unidentified species of *Amoeba*. The organisms appear to form an allied group, the position of which between Mucorales and Entomophthorales is suggested. Their sexual reproduction is by zygosporangia formed from the conjugation of two similar hyphae.

Masera (E.). **Fenomeni di antagonismo e antibiosi fra 'Bacillus prodigiosus Flügge' e 'Beauveria bassiana Vuill.'** [The phenomena of antagonism and antibiosis between *Bacillus prodigiosus* Flügge and *Beauveria bassiana* Vuill.]—*Ann. Sper. agr.*, xv, pp. 117–150, 1 fig., 1 graph, 1934.

The author gives a detailed account of investigations into the association between *Beauveria bassiana* [*R.A.M.*, xiii, p. 575] and *Bacillus prodigiosus* (both of which are pathogenic to silkworms) on the larvae of the flour beetle (*Tenebrio molitor* L.). When the larvae were fed on material containing both organisms together and separately the bacillus proved to be non-pathogenic, but *B. bassiana* killed many of the insects, irrespective of their age. The mortality due to the fungus alone and to the fungus and the bacillus together was, respectively, 57·8 and 39·1 per cent. In the 1,200 individuals exposed to the action of *B. bassiana* alone or with the bacillus mortality set in between the 9th and 10th days, gradually increased to a maximum between the 30th and 50th days, and then declined to the 93rd day, when the experiment terminated.

Tests *in vitro* afforded clear evidence of the inhibitory action of the bacillus on the fungus [cf. ibid., viii, p. 758] brought about on solid media by the fact that the former grew more rapidly than the latter and in liquid media by the liberation of toxins, probably owing to the bacterial lysis, which proved toxic to the mycelium. In liquid (broth) cultures in which the fungal growth was well established before the bacillus was added, the development of the latter was inhibited, probably because the extensive mycelial development on the surface of the liquid interfered with the respiratory activity of the bacillus.

A bibliography of 116 titles is appended.

Ciferri (R.) & Redaelli (P.). **Studii sul Coccidioides immitis Stiles. I. Fenomeni di endosporulazione e di coniugazione in vitro.** [Studies on *Coccidioides immitis* Stiles. I. Phenomena of endosporulation and of conjugation *in vitro*.]—*Boll. Soc. ital. Biol. sper.*, ix, 7, pp. 602–604, 1934.

The phenomenon of endosporulation in the chlamydospores of *Coccidioides immitis* [*R.A.M.*, xiv, p. 234] was observed in cultures from the pus of experimental lesions in guinea-pigs, sown on rabbit's blood- or ascites-serum at 37° to 38° C. under anaerobic conditions. The sporangia were perfectly characteristic, with densely spinescent capsules, but measuring only about half the size of those formed in the host tissues and containing proportionately fewer aplanetic zoospores, the latter being similar to those produced in living animal tissues by relatively avirulent strains of the fungus.

Fusion between two chlamydospores was also observed under the above-mentioned conditions for the first time, the process being analogous to that occurring in certain Olpidiaceae, e.g., *O. viciae* Kusano [ibid., xi, p. 720] and *O. brassicae* [ibid., v, pp. 175, 715; vi, p. 69; vii, p. 202; viii, p. 283] and in *Synchytrium*. A further point of resemblance between the lower Chytridiales and *C. immitis* lies in the presence of a 'companion cell', i.e., a gamete emptied of its plasmatic content and adhering to the zygote. The obscure phenomenon of tricellular fusion was also noticed.

Ciferri (R.). & Redaelli (P.). **Studii sul Coccidioides immitis Stiles. III. La vita saprositica del fungo e il suo potere ammonizzante.** [Studies on *Coccidioides immitis* Stiles. III. The saprophytic life of the fungus and its ammonifying capacity.]—*Boll. Soc. ital. Biol. sper.*, ix, 7, pp. 746–748, 1934.

Various natural substrata of animal or vegetable origin, such as rich garden soil, stable manure, wheat grains, poultry feathers, horsehair and hoofs, human hair, and the like, were found to constitute suitable media for the growth of *Coccidioides immitis* [see preceding abstract]. Development is relatively slow, requiring from 45 days to two months to show up, and is more profuse at 23° to 25° than at 35° to 37° C. Under such conditions the fungus forms a more or less dense, whitish mat on which are produced hyphae and a few chlamydospores.

Ammonia was produced by the fungus in peptone solutions, with or without glucose, and in sterile soil to which peptone was added, the amount being in general proportionate to the initial acidity of the medium.

Trabucchi (E.). **Ricerche sui principii attivi della Segale cornuta. I. Dosaggio chimico e biologico degli alcaloidi specifici. II. Il contenuto in istamina degli estratti fluidi.** [Studies on the active principles of ergot of Rye. I. Chemical and biological dosage of the specific alkaloids. II. The histamin content of the fluid extracts.]—*Boll. Soc. ital. Biol. sper.*, ix, 7, pp. 501–507, 1934.

Analyses of the alkaloid and histamin contents of extracts of various samples of ergot of rye [*Claviceps purpurea*: *R.A.M.*, xiv, p. 93] prepared by the standard methods laid down in Italian and foreign pharmacopoeias having shown a marked deficiency of both these principles, it is assumed that the well-known therapeutic value of the preparations in question resides in other substances of which the nature is obscure.

Boyle (L. W.). **Histological characters of Flax roots in relation to resistance to wilt and root rot.**—*Tech. Bull. U.S. Dep. Agric.* 458, 18 pp., 4 pl., 1934.

Five varieties of flax differing markedly in their reaction to the group of root-parasitic fungi, including *Fusarium lini* [*R.A.M.*, xiv, p. 310], *Asterocystis radicis* [ibid., xiv, p. 12], *Thielavia basicola* [ibid., x, p. 731], *Pythium megalacanthum* [ibid., xiv., p. 77], and *Rhizoctonia* [ibid., iii, p. 265], infesting North Dakota soils that have been continuously under this crop, were studied to determine the histological characters governing relative resistance. The varieties fell into three groups: (1) resistant, represented by Bison, Morye, and Pehanjo; (2) semi-resistant (Ottawa White Flower); and (3) susceptible (Common). No correlation was found between resistance to disease and the deposition of suberin- and lignin-like substances on or in the cortical cell walls of the roots, in the development of the endodermis, or in the constitution of the middle lamellae. The reaction to infection by cell content or cell wall alteration was also similar in susceptible and resistant types. Differences were observed, especially in 20-day-old field-grown plants, between resistant and semi-resistant or susceptible strains of flax in the stability of the cortical cell

walls of the roots as measured by their resistance to hydrolysis by sulphuric acid and the amounts of non-hydrolysable materials that they contained.

Flax growing in soils successively producing this crop over a lengthy period is liable to two types of disease, namely, wilt (*F. lini* and, according to an unpublished thesis by R. B. Streets, University of Wisconsin, 1924, *F. martii* var. *viride* and *F. zonatum* [*F. vasinfectum* var. *zonatum*: ibid., xii, p. 317]) and root rot, in which, besides the fungi listed in the opening paragraph, other species of *Fusarium* may also be implicated. Resistance to each of these two types of disease appears to be correlated with distinct characters in the plants. Reynolds has attributed resistance to *F. lini* to the presence in flax extracts of toxic substances inhibiting the growth of the fungus, while as regards capacity to withstand root rot the outcome of field and histological studies indicates that a part is played by the more rapid and extensive development of stability in the cortical cell walls of the roots.

Brierley (P.). **Symptoms of Rose mosaic.**—Abs. in *Phytopathology*, xxv, 1, p. 8, 1935.

Rose species and varieties exhibit a wide range of chlorotic leaf symptoms suggesting virus infection. Few of these chlorotic types produce mosaic symptoms on budding to Madame Butterfly or other hybrid teas susceptible to White's mosaic [*R.A.M.*, xiv, p. 171]. Among the virus-like types not transmissible by this method is the conspicuous and prevalent crinkle of Manetti. A yellow variety of White's mosaic has been found in Canada and parts of the United States on the Hybrid Tea, Perpetual, and Rugosa types, and like the original form appears to be transmissible only by tissue union.

Brierley (P.). **Streak, a virus disease of Roses.**—Abs. in *Phytopathology*, xxv, 1, pp. 7–8, 1935.

Roses at the Arlington Experiment Farm, Virginia, and elsewhere are stated to be commonly affected by a virus disease producing brownish or reddish circular or veinbanding patterns on the leaves or ring patterns on the shoots. On inoculation by budding, certain hybrid teas, such as Madame Butterfly, develop necrotic areas round the inserted bud. Girdling of the stem usually takes place at the site of the bud, the distal parts die, while the foliage withers but persists. The young lateral branches below the inserted bud frequently show nearly black, sharply defined secondary lesions. Transmission of the virus has been effected only by tissue union. Streak is clearly distinct from mosaic [see preceding abstract] and apparently also from the wilt and die-back described by Grieve from Australia [ibid., x, p. 733].

Deacon (G. E.). **Some effects of Botrytis cinerea on Roses.**—*Rose Annu. 1934*, pp. 62–66, 4 figs., 1934.

Severe die-back is stated to have been produced in actively growing roses of different varieties, including Mrs. A. R. Barraclough, by inoculation experiments with pure cultures of *Botrytis cinerea* isolated from plants showing spontaneous symptoms of the disease in the Norwich district. Control measures are briefly indicated.

Pape (H.). **Löwenmaulrost (Puccinia antirrhini Diet. et Holw.), eine für Deutschland neue Krankheit an Gartenlöwenmaul (Antirrhinum majus L.).** [Snapdragon rust (*Puccinia antirrhini* Diet. et Holw.), a disease of cultivated Snapdragon (*Antirrhinum majus* L.) new to Germany.]—*NachrBl. dtsch. PflSchDienst*, xiv, 12, pp. 113–115, 3 figs., 1934.

Snapdragon rust (*Puccinia antirrhini*) was reported in Germany in July, 1934 [*R.A.M.*, xiv, p. 239 and next abstract] and near Berlin a month later. In an account of the cause and symptoms of the disease it is stated that in one nursery the Primadonna variety remained uninfected when Karminkönigin was heavily attacked. According to Dr. Poeverlein, W. Freiberg of Treves is reported to have found the rust in the fruit capsules, destroying the ovaries and seed, and Poeverlein also states that it was detected by Viennot-Bourgin near Grignon, France, on the wild snapdragon (*Antirrhinum orontium*), which has not hitherto shown any symptoms of the disease in Germany.

Andres (H.). **Der Löwenmaulrost (Puccinia antirrhini Dietel et Holway) in Westdeutschland. (Vorläufige Mitteilung).** [Snapdragon rust (*Puccinia antirrhini* Dietel et Holway) in western Germany. (Preliminary note).]—*Ber. dtsch bot. Ges.*, lii, *1934*, 10, pp. 614–616, 1935.

It is stated in this account of the occurrence of *Puccinia antirrhini* near Bonn in 1934 [see preceding abstract] that Dietel has found that teleutospores formed on the stems may reach a length of 75 μ and have a conical apex and a stalk up to 130 μ, as against 30 to 55 μ with rounded apex and stalk equal to the spore length in the diagnosis of the species and in the sori formed on the leaves. Similar differences between leaf and stem material have been detected by Prof. Dietel only in the case of *P. magnusiana* teleutospores on *Phragmites*. A list is given of the German localities so far known to harbour the snapdragon rust, including besides Bonn and Cologne, other parts of Rhenish Prussia, Westphalia, Baden, Bavaria, Pomerania, and the towns of Berlin and Weimar.

Guterman (C. E. F.). **Control of Aster leaf rust.**—Abs. in *Phytopathology*, xxv, 1, pp. 17–18, 1935.

Commercial China aster [*Callistephus chinensis*] plantings in New York State have been found very liable to leaf rust (*Coleosporium solidaginis* [*R.A.M.*, x, pp. 497, 534], good control of which was obtained in 1934 by eight applications of sulfodust [ibid., x, p. 370], green kolodust [ibid., xiii, pp. 407, 619], flotation sulphur spray, or 3–1½–50 Bordeaux mixture, in descending order of efficacy. Sulfodust reduced the number of lesions per leaf from 18·9 in the check plots to 0·2. In susceptibility tests with 60 commercial varieties virtual immunity from the rust was manifested by California Giant, Giant Branching Comet, Salmon Queen, Imbricated Pompon, and Lilliput flowered (rose, dark blue, and white).

Burkholder (W. H.) & Guterman (C. E. F.). **Bacterial leaf spot of Carnations.**—*Phytopathology*, xxv, 1, pp. 114–120, 1 fig., 1 graph, 1935.

Heavy losses are stated to be caused in the east-central United States and on Long Island by the bacterial leaf spot of carnations due to *Phytomonas woodsii* [*R.A.M.*, x, p. 84], to which the Sophelia variety has shown great susceptibility during the last three years, while Spectrum Supreme, Salmon Spectrum, Potentate, and Patrician have suffered to a lesser extent. Other workers have reported Red and White Matchless, Betty Lou, Eldora, Rosalind, and Sceptre as susceptible. The necrotic spots are sunken, oval, and concentrically zonate with alternating pale brown and purplish rings in the centre and a water-soaked, yellow border. They average 8 to 12 mm. in length and may extend right across the leaf, which ultimately turns straw-coloured, shrivels, and dies. Infection proceeds from the base upwards and may occasionally involve the stems and flower buds. Positive results were given in all cases of inoculation with *P. woodsii* on wounded carnation leaves but not on uninjured tissues. The organism usually occurs singly, is motile by one or more polar flagella, Gram-negative, and measures 1·05 to 2·10 by 0·47 to 1·05 μ (average 1·56 by 0·67 μ). It ferments a number of carbohydrates, produces ammonia in beef-extract bouillon, and grows best at 75° F.

Tilford (P. K.). **Fasciation of Sweet Peas: a bacterial disease.**—Abs. in *Phytopathology*, xxv, 1, p. 36, 1935.

A seed-borne bacterium distinct from *Bacterium tumefaciens* has been isolated from numerous greenhouse sweet peas suffering from a disease the symptoms of which resemble fasciation [*R.A.M.*, ix, p. 527]. Inoculation experiments with the organism gave positive results on sweet and garden peas. Affected plants develop many short, fleshy, thick, aborted stems with misshapen leaves arising from the somewhat dwarfed but otherwise normal main stem at or below soil level, or from the hypocotyl region.

Weiss (F.). **A fungus spot of Azalea flowers.**—Abs. in *Phytopathology*, xxv, 1, p. 38, 1935.

Cultivated azaleas (*Azalea indica*) [*Rhododendron indicum*] in South Carolina were decimated in 1931 by a hitherto unknown disease which caused spotting followed by collapse of the flowers at the period of maximum bloom between late February and mid-April. In addition to various innocuous organisms, a fungus of exceptional morphology was isolated from the diseased flowers and proved by inoculation tests to be solely responsible for the typical symptoms. Within the flower tissues a coarse, septate mycelium is produced and thoroughly disorganizes the cells. The first fructifications are conidia suggestive of *Ovularia*, succeeded by microconidia resembling those of *Sclerotinia*; ultimately cupulate, smooth, black sclerotia are produced.. Microconidia and sclerotia, but not conidia, develop readily on artificial media. Indications of heterothallism and of immature Discomycetous fruit bodies have been observed in culture. The agency of bees in the introduction of the fungus into the flowers has been demonstrated.

POHLMANN (J.). **Botrytis-Krankheit bei Solanum.** [*Botrytis* disease in *Solanum*.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 2, p. 19, 1 fig., 1935.

The attractive, recently developed *Solanum* [*capsicastrum*] variety known as New Paterson is stated to suffer severe damage in Germany from the attacks of grey mould (*Botrytis*), which was not observed on the old Henderson type. Diseased plants may be recognized by their limp, yellow leaves and greyish-yellow, shrivelled berries, and on closer examination by a fine, grey, pulverulent coating over the twigs. Infection is promoted chiefly by closeness and humidity of the atmosphere and may be prevented by giving the plants plenty of light and air and keeping them moderately dry.

BEAUMONT (A.). **Diseases of Narcissi and Tulips.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iii, pp. 184–191, 1935.

In this paper the author gives an extensive list of narcissus and tulip diseases with brief notes on their symptoms and control. The diseases of the former host occurring in England include grey mould or smoulder (*Botrytis narcissicola*) [*R.A.M.*, xi, p. 786], leaf scorch (*Stagonospora curtisii*) [ibid., xiii, p. 447], white mould (*Ramularia vallisumbrosae*) [ibid., xii, p. 551], fire (*B. polyblastis*) [ibid., ix, p. 624], the rusts due to *Coleosporium narcissi* and *Puccinia schroeteri*, chlorosis, physiological purple spot, grey disease or stripe, yellow stripe, rootplate rot and root rot associated with *Cylindrocarpon radicicola* [ibid., xii, p. 224], bulb rot associated with *Fusarium bulbigenum* [loc. cit.], *Penicillium* storage rot, black bulb rot (*Rosellinia necatrix*) [ibid., ix, p. 624] and the similar condition due to *Armillaria mellea* [ibid., xi, pp. 376, 786], secondary bulb decay (associated with *Trichoderma viride*, bacteria, *Penicillium* spp., and *Rhizopus nigricans*), and scale speck, due to an organism not yet definitely identified. Grey disease is characterized by longitudinal striping or mottling, generally over the whole leaf surface and frequently extending to the flower. The size of the bulbs and the rate of increase are usually reduced. As the symptoms vary on different varieties and in different seasons, a number of diseases may be concerned. No evidence has been obtained that the disease, as found in England, is due to a virus [cf. ibid., xi, pp. 578, 785]. Yellow stripe, first observed by the author in 1929, was very serious on King Alfred and related Trumpet varieties in 1932; it differs from grey disease (of which it may possibly be a varietal form) in that under good cultural conditions there is a large percentage of recovery in subsequent seasons. It may be a foliage symptom associated with a bulb disease.

The tulip diseases dealt with include fire (*B. tulipae*) [ibid., xiii, p. 10], shanking and blossom blight (*Phytophthora* spp.), greenhouse spot (*F. tuberculariodes*) [ibid., xiii, p. 681], breaking [ibid., xiii, p. 446], and *Penicillium* storage rot. The paper concludes with general notes on control.

AINSWORTH (G. C.). **Spotted wilt of Richardias (Arums).**—*Gdnr's Chron.*, xcvii, 2507, p. 31, 1 fig., 1935.

Attention is drawn to the occurrence in England of tomato spotted wilt [*R.A.M.*, xiv, pp. 129, 262] on the arum lily (*Richardia africana*)

[*Zantedeschia aethiopica*], stated to have been first reported early in 1934 by L. Ogilvie and K. M. Smith. The disease is marked by the development of yellow spots, blotches, or streaks on the leaves, white streaks on the foliage and petioles, and pale, blotchy lesions on the green flower buds. The leaves are variously crinkled and twisted, and the flowers deformed. This is stated to be the first recorded monocotyledonous host of spotted wilt. Eradication of infected plants and measures to control the insect vector, *Thrips tabaci*, are recommended.

Wolf (F. A.). **Morphology of Polythrincium, causing sooty blotch of Clover.**—*Mycologia*, xxvii, 1, pp. 58–73, 5 figs., 1935.

This is a morphological study of the fungus responsible for the sooty blotch of clover, the life-cycle of which comprises a conidial, a spermogonial, and a perithecial stage. The undulate character of the conidiophores is the consequence of sympodial branching. Each conidiophore produces a series of conidia, the delimitation of each of which is followed by elongation of the conidiophore. The spermogonia and perithecial fundaments are both formed during the autumn within the same or in separate stromata; each is locular. The spermogonia produce spermatia which are apparently essential to the development, in the following spring, of the perithecia.

The fungus has received several names, including *Sphaeria trifolii*, *Placosphaeria trifolii*, *Polythrincium trifolii*, *Phyllachora trifolii*, *Plowrightia trifolii*, and *Dothidella trifolii* [*R.A.M.*, iv, pp. 96, 396, 446; viii, p. 176], none of which, in the writer's opinion, correctly interprets its taxonomic characters in the family Dothidiaceae. The new generic name of *Cymadothea* is proposed for it, on the ground that its conidial mechanism is distinctive. Latin diagnoses are given of the new genus and its type species, *C. trifolii* (Pers.) comb. nov.

Wormald (H.). **The brown rot diseases of fruit trees.**—*Bull. Minist. Agric., Lond.*, 88, 50 pp., 40 figs., 1935.

In this bulletin, written both for mycologists and practical growers, an authoritative and up-to-date account is given of the available information on the brown rots of fruits caused by *Sclerotinia fructigena*, *S. laxa*, and *S. fructicola* [*R.A.M.*, xiii, pp. 33, 110]. Short sections are devoted to the history of early English and foreign investigations into the condition, the nomenclature, geographical distribution, morphology and cultural characters of the causal organisms, and the pathology of, and losses caused by the diseases. Notes are given on the brown rots and their control as affecting the different hosts, apple, pear, plum, cherry, peach, apricot, and quince. Bibliographies of works by British and other writers are appended, and there are forty plates and drawings, all except four by the author.

Atanasoff (D.). **Mosaic disease of drupaceous fruit trees.**—*Annu. Univ. Sofia*, xiii, pp. 9–42, 26 figs., 1934.

In this paper a general account is given of the author's observations up to date on plum pox [*R.A.M.*, xii, p. 229], for which he now prefers the name mosaic, as certain hosts show no surface depressions on the fruit, while all show pronounced leaf mottling. The disease has been

observed in Bulgaria, Czecho-Slovakia, Holland, England, and the United States on almond, apricot, cherry, peach, and plum. It is intertransmissible, and can easily be communicated from diseased to healthy trees by budding; under natural conditions it is spread from plum to plum (and probably to other hosts) by the aphid *Anuraphis padi*. Successful transmissions by budding were made from apricot, cherry, and plum to plum; from cherry, plum, and peach to peach; and from plum to cherry.

MacLachlan (J. D.). **The hosts of Gymnosporangium globosum Farl. and their relative susceptibility.**—*J. Arnold Arbor.*, xvi, 1, pp. 98–142, 4 pl., 3 graphs, 1 map, 1935.

A full account is given of the author's studies from 1932 to 1934, in the Arnold Arboretum, of the relative susceptibility to *Gymnosporangium globosum* [*R.A.M.*, xiii, p. 311] of the aecidial hosts of the rust included in ten genera of the Pomoideae. Taken in conjunction with those of previous workers his results indicated that species of *Crataegus* differ widely in their susceptibility, this depending primarily on the thickness and rapidity of formation of the leaf cuticle; none of the groups examined (including altogether nearly 550 species) proved to be wholly immune. Of the 17 species of *Pyrus* tested, 1 was found to be very susceptible, 2 moderately susceptible, 10 (including *P. communis*) resistant, and 3 immune. Two of the 7 American species of *Malus* which were inoculated proved to be mildly and one moderately susceptible, while of the 27 Eurasian types tested infection was obtained on only 1 species and 3 hybrids, as well as on 2 hybrids between American and Eurasian species. Certain of the commercial varieties of apples, however, appear from previous reports to be more susceptible than the species tested. All the American species and varieties of *Sorbus* inoculated were susceptible, while of the 31 species and varieties of Eurasian origin 27 proved to be immune and 4 resistant. Inoculations on 17 species and varieties of *Amelanchier* gave negative results, and no reports could be found indicating high susceptibility of representatives of this genus to the rust, although it has been recorded on *A. canadensis* and *A. alnifolia*. *Cydonia oblonga* was shown to be moderately susceptible, and the rust has been reported as occurring commonly on quince in New Jersey. Species of *Crataegomespilus*, *Mespilus*, *Sorbaronia*, and *Sorbopyrus* were more or less susceptible, while the genera *Comptonia*, *Myrica*, and *Photinia* were shown by inoculations to be immune.

While according to previous reports the host list of the teleutospore stage of *G. globosum* includes at least six species of *Juniperus*, there is no information to date to indicate that any species other than *J. virginiana* and *J. scopulorum* and their varieties suffer to any extent from infection with the rust.

The paper includes a complete list of all the known hosts of *G. globosum*.

Nusbaum (C. J.). **A cytological study of the resistance of Apple varieties to Gymnosporangium juniperi virginianae.**—Abs. in *Phytopathology*, xxv, 1, p. 30, 1935.

The sporidial germ-tubes penetrated equally well into leaves of four

apple varieties differing in their reaction to rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xiv, p. 150]. A conspicuous primary hypha was formed in an epidermal cell, but further mycelial development was regularly intercellular, with characteristic haustorial production. In Wealthy leaves at a susceptible stage, the pathogen made vigorous growth. The other varieties tested showed resistance, due evidently to a definite antagonism of the host cells to the invading parasite. This reaction was mild in Yellow Transparent, noticeable in Fameuse, and very pronounced in Baldwin. With advancing maturity Wealthy leaves gradually acquired resistance, the rust failing to develop pycnidia in those that had just reached full size and being unable to effect epidermal cell penetration a few weeks later.

Turnbull (J.). **Fruit tree spraying equipment.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iii, pp. 24–32, 1935.

Helpful practical notes (designed to assist growers in the selection of the most efficient spraying materials and methods) are given on spraying outfits (with particular reference to the correct estimate of the pump capacity required and the maintenance of efficient pressure), spraying systems (mechanical, mobile, headland, and central), and spray nozzles, lances, and guns. The paper is followed by a discussion.

Carter (Miss F. M.). **A brief account of fungi present in the air over orchards, with especial reference to Pleospora and Polyopeus.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 145–153, 1 fig., 1935.

The author gives a list of the fungi, belonging to 34 genera (with the specific name where determined), which were obtained from the air in apple orchards at East Malling Research Station, at the Horticultural College, Swanley, and in the vicinity of Belfast [cf. *R.A.M.*, xi, p. 51]. Cultural details are also given of 16 strains of *Pleospora herbarum* and 8 apparently hitherto undescribed forms of *Polyopeus*, both of which were very frequently found in the exposed plates and are definitely known to cause apple fruit rots [ibid., xiii, p. 583]. The investigation suggests that storage diseases of apples are chiefly due to fungal infection from the atmosphere before harvest.

Annotated bibliography on bitter-pit.—*Occ. Pap. Bur. Fruit Prod. E. Malling*, no. 3, 28 pp., 1934.

This useful bibliography, preceded by a short introduction by J. Barker on the prevention of the disease, includes very brief summaries of the chief papers published since 1869 on bitter pit of apples [*R.A.M.*, xiii, p. 707].

Riker (A. J.), Palmiter (D. H.), & Hildebrand (E. M.). **Some environmental factors influencing the development of Apple hairy-root and of Phytomonas rhizogenes.**—Abs. in *Phytopathology*, xxv, 1, p. 32, 1935.

In soil at 75 per cent. of its moisture-holding capacity the highest incidence of infection in inoculations with the hairy root organism *Phytomonas* [*Bacterium*] *rhizogenes* [*R.A.M.*, xiv, p. 289] occurred at a soil temperature of 28° C., and the largest hairy root growth at 24°.

Hairy root formation was slightly greater at 90 per cent. moisture than at 75, but infection rather less. The organism grew best on yeast infusion-mannitol and carrot extract agars at 28°, and produced the most acid and densest turbidity in a yeast infusion-mannitol liquid medium at the same temperature.

HILDEBRAND (E. M.) & MACDANIELS (L. H.). **Modes of entry of Erwinia amylovora into the flowers of the principal pome fruits.**—Abs. in *Phytopathology*, xxv, 1, p. 20, 1935.

The causal organism of fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, xiv, p. 318 and next abstracts] appears to enter pear, apple, and quince flowers through the following natural openings: (1) non-cutinized tissue (stigmatic surface, anther); (2) hydathodes (sepals); (3) stomata (style, fruit exterior, sepals); and (4) specialized nectar-secreting stomata (receptacle cup).

ROSEN (H. R.). **The mode of penetration of Pear and Apple blossoms by the fire-blight pathogen.**—*Science*, N.S., lxxxi, 2088, p. 26, 1935.

The fireblight pathogen (*Erwinia amylovora*) [*Bacillus amylovorus*] has been observed in Arkansas to penetrate the nectarial region of apples and pears [see preceding and next abstracts] by way of the stoma-like channels through which the nectar is exuded, here termed 'nectarthodes'. This mode of ingress appears to be much more common in pears, with their broad, open, shallow calyx cups, than in apples, the calyx cups of which are narrow, elongated, and tightly covered. The organism is further capable of penetrating the stigmatic surfaces of both pear and apple gynoecia and the anther locules, possibly with an extension into the filaments. These points of entry are additional to those already known in the calyx and corolla.

LINK (G. K. K.). **Relation of carbohydrate-nitrogen nutrition to disposition of Apple to infection by Erwinia amylovora.**—Abs. in *Phytopathology*, xxv, 1, p. 26, 1935.

Stayman apple trees were grown in sand culture in Chicago tanks, one lot receiving, once only, a complete or plus-nitrate (2·08 gm. per plant) solution, and the other a solution without nitrate. Both lots were inoculated simultaneously with *Bacillus amylovorus* [see preceding abstracts], to which the succulent, large-leaved shoots of the plus-nitrate (low carbohydrate-nitrogen ratio) plants proved susceptible, while the short, thin, woody, small-leaved shoots of the series without nitrate were resistant. The former maintained their susceptibility throughout the season in new shoots developed below the lesions. These results are considered to illustrate the role of past experience in etiological complexes of health and disease in plants [cf. *R.A.M.*, xiii, p. 253].

HILDEBRAND (E. M.). **Longevity of the fire-blight organism in the honeybee environment.**—Abs. in *Phytopathology*, xxv, 1, p. 20, 1935.

The following facts, ascertained in the course of three years' studies in New York, are thought to denote the improbability of the overwintering of *Erwinia amylovora* [*Bacillus amylovorus*] in the beehive [*R.A.M.*, xiv, p. 318]: (1) the disappearance within three days of the

bacteria from honey elaborated from food containing the organism; (2) the inability to identify the organism with stages in the insect's life-cycle; (3) the relatively high temperatures (up to 35° C.) of the bodies of honey-bees and of hive interiors; (4) the short life of the bacteria in sugar solutions at different concentrations and constant temperatures; and (5) the relatively poor dissemination of the bacteria to flowers caged with honey-bees fed on heavily infected sugar solutions.

Marchionatto (J. B.). **Argentine Republic: the overwintering stages of Pear and Apple scab.**—*Int. Bull. Pl. Prot.*, ix, 1, pp. 1–2, 1935.

Notes are given on the prevalence of apple and pear scab in the Argentine Republic, where the perithecial stage of the two causal organisms, *Venturia inaequalis* and *V. pirina*, was observed for the first time in 1934.

Loewel (E. L.). **Die Wirkung der Vorblütenspritzungen gegen Fusikladium.** [The effect of the pre-blossom sprays on *Fusicladium*.]—*Obst- u. Gemüseb.*, lxxxi, 1, pp. 8–9, 1935.

A tabulated account is given of the writer's experiments against *Fusicladium* [*Venturia inaequalis*] on Schur apples in the Lower Elbe valley, Schleswig-Holstein [*R.A.M.*, xiii, p. 449], from which it appears that the best of the pre-blossom treatments tested were the 'Baumspritzmittel' (a tar product of the same order as carbolineum) at the rate of 8 per cent. and 1 per cent. Bordeaux (Wacker). In the trials described the former preparation was applied on 4th to 5th April and the latter on 30th May, followed by the usual four post-blossom treatments.

Foster (H. H.). **Infection of Apple leaves by Physalospora cydoniae.**—Abs. in *Phytopathology*, xxv, 1, pp. 16–17, 1935.

Only 10 out of 30 strains of *Physalospora cydoniae* [? *P. obtusa*: *R.A.M.*, xiv, p. 316] consistently produced infection on inoculation by means of pycnospore suspensions on apple leaves. Eight of the 10 were derived from rotted apple and quince fruits in the eastern States [cf. ibid., xiii, p. 312], one from a Chinese quince [*Pyrus sinensis*] in France, and one from an apple leaf in South Carolina. The incubation period ranged from 24 to 72 hours. Penetration was found to take place through the stomata.

Baines (R. C.). **Phytophthora trunk canker of Apple.**—Abs. in *Phytopathology*, xxv, 1, p. 5, 1935.

A destructive, irregular canker of Grimes apples in Indiana is caused by *Phytophthora cactorum* [cf. *R.A.M.*, ix, p. 392], which may partially or completely girdle the trunk and bases of the main branches. The first external symptom is a wet area on the bark, but the fungus penetrates into the sapwood. Successful inoculations were obtained on the trunks but not on the limbs. The scarification of the diseased areas gave promising results as a control measure.

Berg (A.). **Black pox and other Apple-bark diseases commonly known as measles.**—*Bull. W. Va agric. Exp. Sta.* 260, 24 pp., 7 pl., 3 figs., 1934. [Received April, 1935.]

After a brief review of the literature dealing with the papular or bark-blistering diseases of the apple, which have been apparently confused together under the name of measles, the author gives details of his studies [abstracts of some of which have already been noticed: *R.A.M.*, xi, p. 248; xii, p. 378, and above, p. 349] of the trouble in West Virginia. He found that there are at least three different diseases involved, one of which (termed black pox) is due to an apparently hitherto undescribed species of *Helminthosporium* (previously thought to be a *Clasterosporium*) [loc. cit.], for which the name *H. papulosum* n.sp. is suggested, a Latin diagnosis being appended. The conidiophores arise most abundantly from the central surface of the dead, scaly patches on the bark, either singly or united at the base in fascicles; they are dark brown, typically three- to many-septate, 64 to 110 by 4·2 to 5·9 μ in diameter. On the natural substratum the apically abstricted conidia are sub-hyaline to fuliginous, three- to many-septate, usually widest at the second segment from the base, with a blunt basal end bearing a pronounced dark scar, and measure 29 to 46 by 6·6 to 8·2 μ; under moist conditions they tend to produce narrow, thin-walled, apical elongations of three to more cells which are easily broken off. Germination is effected by two polar germ-tubes. In pure culture the fungus grows very slowly even at the optimum temperature (about 28° C.), and makes no growth below 15°. The conidia produced on artificial media are much more irregular in size and shape and show a tendency to degenerate; a rather unusual feature is the presence on such conidia of spherical vesicles of an exudate which is produced usually after the formation of the third or fourth segment, and which is retained on the mature conidium as an enveloping sheath. *H. papulosum* was also isolated from black fruit spots on Grimes Golden apples at Purdue, Indiana [ibid., xii, p. 378], but this phase of the disease does not appear to be important under West Virginian conditions. The disease occurs in New Jersey, Ohio, Indiana, and Mississippi, in the last-named State also on Bartlett pears. Experiments in 1933 indicated that it can be controlled to a considerable extent by thorough spraying with Bordeaux mixture or lime-sulphur.

The second disease, which is widespread and destructive on the Delicious variety of apples, was shown to bear no relationship to black pox. It often attacks young trees in a vigorous growing condition; when severely affected the trees may soon be killed, while in milder cases they may linger for several years in an unthrifty and stunted state; trees only slightly attacked usually recover. The cause of this disease has not yet been established. Owing to the frequent presence of groups of necrotic cells deep in the bark, it is provisionally termed internal bark necrosis pending the establishment of its relationship to the third type or true measles which has also been observed in West Virginia mostly on Jonathan and York apples, chiefly on older trees past their prime and weakened apparently by some other cause; this last disease has not been studied more closely because it does not appear to be very injurious.

Cooley (J. S.). **Relation of host vigor to Apple infection with Xylaria mali.**—Abs. in *Phytopathology*, xxv, 1, pp. 12–13, 1935.

Monthly inoculation experiments for two years with *Xylaria mali* [*R.A.M.*, xiii, p. 384] on three-year-old apple seedlings at Rosslyn, Virginia, indicated that the period of maximum susceptibility to the fungus is correlated with the minimum degree of root activity. Suppressed trees in the nursery row were much more liable to attack than those growing normally, while defoliation in August also enhanced susceptibility. Evidently a weakened host condition resulting from drought or other environmental factors predisposes the trees to severe root-rot infection.

Haussmann (G.). **Contributo alla conoscenza delle malattie crittogamiche delle frutta refrigerate.** [A contribution to the knowledge of fungal diseases of fruit in cold storage.]—*Ann. Sper. agr.*, xv, pp. 101–116, 5 pl. (2 col.), 1934.

When healthy apples of ten varieties grown in two localities in Piedmont were stored at 1° to 3° C., the varieties most resistant to fungal attack were Ranetta verde, Verdese (both grown at Cuneo), and Calvilla Lesson. After three months' storage the first-named showed a loss in weight from fungal decay of 5 per cent., while the other two even after six months showed only a trace of attack, infection in all three cases being due to *Penicillium* spp. Most of the decay found on the other varieties was of the green or black type due, respectively, to *P.* spp. (including *P. olivino-viride*, *P. italicum*, and *P. expansum*) and *Cladosporium nodulosum* Cda.

Pavarino (G. L.). **Contributo allo studio del disfacimento interno delle Pere.** [A contribution to the study of internal breakdown of Pears.] —*Ann. Sper. agr.*, xv, pp. 23–29, 5 col. pl., 1934.

In this account of a microscopical and microchemical study of internal breakdown in three varieties of pears in cold storage in Italy [*R.A.M.*, xii, p. 102], the author describes the histology of the affected tissues and the pathological changes undergone by the cells. In the mesocarp of the diseased pears a light, apparently normal, starchy zone surrounds the blackened endocarp, and outside this is a discoloured, rather narrow zone of spongy, brownish, necrosed tissue in which the cohesion of the cells is diminished. The vessels in the discoloured area are dark brown and this alteration appears to precede that of the surrounding tissues. In fruits with different anatomical characters the disease assumes a slightly different appearance macroscopically, but the structural alterations remain substantially the same. The most resistant varieties are those which have a granular flesh and only a small amount of spongy tissue.

Goidànich (G.). **Una nuova specie di 'Ceratostomella' ('Ceratostomella catoniana' G. Goid. n.sp.) vivente sul Pero.** [A new species of *Ceratostomella* (*C. catoniana* G. Goid n.sp.) living on the Pear.]—*R.C. Accad. Lincei*, xxi, 3, pp. 199–201. 1935.

A preliminary note is given on a new species of *Ceratostomella*, *C. catoniana*, isolated by the writer from two-year-old pear trees showing

a sectorial chestnut discoloration of the wood, involving mainly the upper portion of the trunk. The tissues affected were parts of the woody parenchyma, the medullary rays, and some of the vessels, which were occluded by a gummy substance. From a distance of 30 cm. and upwards above soil level the wood was attacked by the boring insect *Xyleborus dispar*, between which and the *Ceratostomella* symbiotic relations may well exist [cf. *R.A.M.*, xiv, p. 68]. The disease is reported to be widespread also on apples in the valleys of Sole and Non and at Madiano de Bergine.

The mycelium and a few fructifications of the fungus were found in the infected tissues. Besides the perfect stage, the organism produces unicellular, variable conidia of the *Cladosporium* type [ibid., xiv, p. 274] and coremia of a *Graphium* (*G. pirinum* G. Goid.). *C. catoniana* is definitely homothallic, none of the 20 monospore isolations having failed to give rise to perithecia. Inoculation experiments will be undertaken to ascertain the degree of pathogenicity of the new species.

Goetz (O.). **Die italienischen Burbank-Pflaumenanlagen durch Graphium ulmi zerstört?** [Are the Italian Burbank Plum plantings destroyed by *Graphium ulmi*?]—*Obst- u. Gemüseb.*, lxxxi, 2, p. 28, 1935.

An article in the *Schweizerische Zeitschrift für Obst- und Weinbau* (No. 1, 1935) states that the extensive Burbank plum plantings in the Romagna, Italy, have been suffering since 1931 from a destructive disease suggesting infection by *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xiv, p. 133], which threatens to exterminate the entire Burbank cultivation.

[The symptoms described seem closely to resemble those first reported by Goidànich in 1933 [ibid., xiv, p. 320], and in a letter to the Director of the Imperial Mycological Institute, dated 1st April, 1935, Prof. L. Petri categorically refutes the alleged implication of *C. ulmi* as a cause of disease in Burbank plums in Italy.]

Kunkel (L. O.). **Heat treatment for the cure of yellows and rosette of Peach.**—Abs. in *Phytopathology*, xxv, 1, p. 24, 1935.

An apparently permanent cure of peach yellows and rosette [*R.A.M.*, xiv, p. 219] was effected by the incubation of potted trees at a temperature ranging from 34·4° to 36·3° C. for a fortnight or more. Some difficulty was experienced in the destruction of the virus in the roots, due probably to the cooling effect of evaporation in the moist earth. This suggests that the phony peach virus [ibid., xiii, p. 38] may be confined to the underground part owing to the exposure of the upper portions to high summer temperatures.

Mix (A. J.). **The life history of Taphrina deformans.**—*Phytopathology*, xxv, 1, pp. 41–66, 6 figs., 1935.

As in the writer's previous investigations [*R.A.M.*, iii, p. 659], negative results were given by attempts to isolate *Taphrina deformans* from the surfaces of overwintering peach twigs in Kansas. Though there is very strong circumstantial evidence of the presence of the conidia on such twigs, they are overrun by the faster-growing fungi with which

they are associated. Inoculation experiments on young Elberta trees showed that the conidia of *T. deformans* can survive on the twigs and infect the unfolding leaves even after a year. A bagging test showed that the exclusion of the ascospores from the twig surfaces resulted in absence of curl the following spring. The conidia are believed to overwinter, not only on the surfaces of the bud scales, but on those of all parts of the dormant tree [cf. ibid., xiii, p. 452].

Perennial mycelium could not be detected in diseased peach twigs and there is no evidence of this method of survival from one season to the next. The infecting conidia send germ-tubes through the outer walls of the lower leaf epidermis and possibly, in the case of late attacks, through those of the upper one also. Some lateral growth may occur beneath the cuticle. A subepidermal intercellular mycelium is then established and gives rise in the radial epidermal walls to branches constituting the subcuticular hymenium. Asci are occasionally borne on the lower leaf surfaces as well as on the upper one.

In *T. deformans* the dicaryophase normally originates by nuclear division in one conidium, the occasional occurrence of copulation being possibly reminiscent of a once functional process but in no sense a necessary phase in the life-history of the organism. It was further shown by inoculation experiments that infection may be caused by conidia descended from each of the eight ascospores of an ascus, so that conidial copulation is not an essential preliminary to invasion.

It was incidentally ascertained in the course of these studies that the conidia of *T. deformans* are able to infect peach shoots after eleven years in artificial culture, under which conditions also cells of the dicaryophase and diplophase may be formed. The asci produced in culture are frequently abortive, but a few containing ascospores have been observed. Saprophytic growth in culture must be initiated by ascospores or conidia (haploid), the diploid stage in the leaf mycelium failing to grow in culture. Once started, however, the cultures may give diploid cells.

Fisher (Eileen). **Observations on Fomes pomaceus (Pers.) Big. & Guill. infecting Plum trees.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 102–113, 4 figs., 1935.

An account is given of the author's investigation in 1931–2 of *Fomes pomaceus* [*R.A.M.*, vii, p. 648], which is stated to occur frequently on old plum trees in Cambridgeshire. The Pershore variety is generally the most susceptible but in one plantation a large number of Victoria trees were found to be heavily infected. Periodical tests of the germinability of the basidiospores after their liberation from the sporophore indicated that they may retain their viability for as long as 24 weeks when kept dry on glass slides; the mycelium also proved to be very resistant to desiccation, as a fresh culture was obtained from one on a plum wood block after 3½ years.

The results of a microchemical study of the effects of *F. pomaceus* on invaded plum wood supported Brooks's and Storey's view in infection with *Stereum purpureum* [ibid., iii, p. 343] that the copious formation of gum, which is characteristic of the early stages of decay, is associated with removal of starch from the medullary ray cells. They also showed

that the subsequent white rot stage is due not to delignification of the woody elements, as was previously supposed, but to removal of the thick internal layer of the wood fibres, which was shown to be rich in cellulose but devoid of the aldehydes usually associated with lignin. The medullary ray cells are the last to be attacked.

Inoculation experiments with spores and mycelium indicated that *F. pomaceus* is but a weak parasite on plum, and that the Pershore variety is slightly more susceptible than Victoria.

MAGIE (R. O.). **Variability of monosporic cultures of Coccomyces hiemalis.**—Abs. in *Phytopathology*, xxv, 1, pp. 26–27, 1935.

Considerable variations were detected between 20 strains of the cherry pathogen, *Coccomyces hiemalis* [*R.A.M.*, xiv, p. 178], from six States in colony colour and contour, growth rate, acid production, spore formation, and conidial length. Germination occurred over a P_H range from 2·9 to 8·5, while growth and the production of spores on agar took place at temperatures from 4° to 28° C., the optimum for growth being 20° to 24° and for spore production 12° or 16°. Pathogenicity tests with more than a dozen isolations of the fungus on several species of *Prunus* indicated appreciable susceptibility only in sweet and sour cherries, and gave no indication of the occurrence of physiologic forms.

HOAGLAND (D. R.) & SNYDER (W. C.). **Nutrition of Strawberry plant under controlled conditions: (a) Effects of deficiencies of boron and certain other elements: (b) Susceptibility to injury from sodium salts.**—*Proc. Amer. Soc. hort. Sci.*, xxx, pp. 288–294, 5 figs., 1934. [Received March, 1935.]

The results of the experiments reported in some detail in this paper, in which strawberry (Banner and Nich Ohmer) plants were grown in a standard nutrient solution alone and with the addition of various elements, showed that the striking symptoms of malnutrition which developed in the first series were in a large measure caused by deficiency in boron. In subsequent tests, however, it was seen that plants receiving additions of only boron and manganese were distinctly inferior to plants receiving the complete elements in colour, general appearance, and development of runners, suggesting that copper or zinc or both, and perhaps still other elements, were also needed. The experiments further indicated that the strawberry requires much more than a trace of boron for normal growth. Incidentally it was noted that plants growing in the solution to which an enlarged supplementary group of elements had been added were almost completely free from mildew [*Sphaerotheca humuli*] and red spider, while plants without any supplementary elements were very susceptible to both organisms.

The Nich Ohmer variety was shown to be highly sensitive to even moderate concentrations (100 to 500 p.p.m.) of sodium salts, among which sodium sulphate and sodium chloride chiefly caused a marginal burning which sometimes spread until the whole leaf was killed. Plants grown in solutions containing small amounts of sodium bicarbonate showed marked root necrosis and some yellowing of the foliage.

Arnaud (G.). **Le dépérissement du Cassissier.** [The dying-off of the Black currant.]—*Rev. hort., Paris*, cvi, 10, pp. 228–229, 1934.

A dying-off of black currants prevalent in the Dijon district of France and at Versailles was found to be due to a species of *Phomopsis* only the β spores of which developed in pure culture [cf. *R.A.M.*, iii, p. 433]. Artificial inoculation experiments with the pathogen gave positive results through wounds, but the progress of infection was very slow. Longitudinal sections through diseased branches revealed a grey or light brown discoloration of the wood. The control of this form of dying-off presents considerable difficulty; the diseased material should be excised to a distance of 10 cm. below the infected area and the wound disinfected.

Anthracnose (*Gloeosporium ribis*) [ibid., ix, p. 472] may be effectively combated in the Côte-d'Or by the application of Bordeaux mixture between 15th May and 1st June.

Hahn (G. G.). **Immunity of Viking, a Norwegian Red Currant, to Cronartium ribicola and C. occidentale under greenhouse conditions.**—*Circ. U.S. Dep. Agric.* 330, 16 pp., 1 col. pl., 2 figs., 1935.

A red currant variety from Norway, apparently a hybrid form of *Ribes petraeum*, which is given the new name of Viking (syn. Rød Hollandsk Druerips [Red Dutch Grape Currant]), has proved immune from white pine (*Pinus strobus*) blister rust (*Cronartium ribicola*) in four years' greenhouse testing, in Scotland in 1929 and in the United States from 1930 to 1932 [*R.A.M.*, ix, p. 192]. It has also given evidence of immunity from *C. occidentale* [ibid., ix, p. 570] on *P. monophylla*. None of the Viking plants, numbering about 1,000, set out in close proximity to pines infected by *C. ribicola* in New England, New York, Oregon, and Canada during 1932–3 have hitherto shown any sign of blister rust.

Blodgett (E. C.). **Pathogenicity and physiology of Pseudopeziza ribis.**—Abs. in *Phytopathology*, xxv, 1, pp. 6–7, 1935.

Studies of 7 isolates of *Pseudopeziza ribis*, the agent of anthracnose of *Ribes* spp., from Wisconsin, Oregon, Canada, and the Netherlands [*R.A.M.*, viii, p. 22; xiii, p. 104] revealed considerable strain differences. The microconidia of isolate 2 were over twice the length of those of isolate 4. The optimum temperatures for conidial and ascospore germination were 20° and 12° C., respectively. The best conidial germination and growth were made at P_H 5·3 to 5·7. Inoculations with conidia, and in a few cases with ascospores, showed that currant strains are more pathogenic to currants than to gooseberry; penetration is effected directly through either leaf surface and all common garden varieties are liable to severe attack. The ascigerous stage was found in profusion on currant and gooseberry.

Kadow (K. J.). **The Raspberry white-bud disease and its relation to bitter rot of Apples.**—*Phytopathology*, xxv, 1, pp. 91–103, 4 figs., 1 graph, 1935.

The Erskine Park and a number of other raspberry varieties in Illinois are liable to a disease known as 'white bud', characterized by a whitish-grey discoloration of the tissues round the lateral buds, which

usually die following premature leaf fall. The lesions always appear to be localized at the point of union of the cane and the leaf petiole. Small *Colletotrichum* acervuli and rudimentary perithecia develop on the spots after defoliation. The conidia measure 11 to 18 by 3 to 7 μ and setae were generally abundant on the raspberry but did not form on inoculated apples. In culture, mature perithecia of a *Glomerella* developed on bean pod agar after six weeks at room temperature.

From a comparative study of the raspberry organism and the closely related agent of apple bitter rot, *G. cingulata* [*R.A.M.*, vii, p. 332], the conclusion was reached that the cultural and morphological differences between the two are such as to warrant specific separation, the former being apparently identical with *G. rubicola* (Ston.) S. & S. Both fungi caused typical bitter rot of Ben Davis and Grimes apples in inoculation tests, but *G. cingulata* gave negative results on Erskine Park raspberry canes. Apples were infected through the unbroken epidermis by atomized suspensions of *G. cingulata* but not by those of *G. rubicola*. The latter caused white bud of raspberries by direct epidermal penetration through the unweathered tissue at the junction of petiole and stem.

Panama disease of Bananas.—*J. Jamaica agric. Soc.*, xxxix, 1, p. 30, 1935.

At a Board meeting of the Jamaica Agricultural Society in January, 1935, the Director of Agriculture called attention to the serious situation existing in the parish of St. Mary, where the Government had approved of the 1-root treatment against Panama disease [*Fusarium oxysporum cubense*: *R.A.M.*, xiv, p. 113]. It now appeared that the provision, which had been specifically retained, whereby no quarantine area could be replanted had been ignored by several growers, thus causing very serious danger of increasing the spread of the disease by disturbing infected soil. In the last 22 years some 20,000 acres in Jamaica had gone out of banana cultivation owing to the ravages of the disease.

Reinking (O. A.). **Soil and Fusarium diseases.**—*Zbl. Bakt.*, Abt. 2, xci, 11–15, pp. 243–255, 1935.

Various diseases caused by species of *Fusarium* appear to be closely correlated with soil conditions [*R.A.M.*, xiii, p. 594]. Banana wilt (*F. oxysporum* f. 3) [*F. oxysporum cubense*: ibid., xiv, p. 323 and preceding abstract], for instance, was found in Panama, Honduras, and Costa Rica to be more severe on sandy than on clay soils, a fact that may assume considerable importance in the formulation of control measures. Evidently the ability of the wilt fungus to persist for lengthy periods as a saprophyte in the soil depends on the constitution of the latter. It is known to persist for ten years in the sandy soils of Costa Rica.

Carter (W.). **Mechanical transmission of two viruses to Pineapple.**—Abs. in *Phytopathology*, xxv, 1, p. 10, 1935.

Mosaic of *Commelina nudiflora* in Hawaii appears to be identical with that described from Florida [*R.A.M.*, xiv, p. 93]. Natural transmission

to pineapple is unknown, but in a few instances infection has been artificially conveyed by needle punctures. The disease is lethal to the pineapple, its symptoms being indistinguishable from those of yellow spot [ibid., xii, p. 304] as shown by a single case of needle transmission of the latter from an infected to a healthy pineapple.

CARTER (W.). **The symbionts of Pseudococcus brevipes in relation to a phytotoxic secretion of the insect.**—Abs. in *Phytopathology*, xxv, 1, p. 10, 1935.

Green spotting of pineapple leaves in Hawaii, a toxic effect of feeding by *Pseudococcus brevipes* [*R.A.M.*, xiii, p. 586], is stated to be invariably associated with the presence in the insect of a bacillus-like symbiont. When the insect colony is transferred from pineapple to *Panicum barbinode*, the green-spotting capacity is lost and at the same time the symbiont gradually disappears. The return of the mealy bug colony to pineapple has hitherto failed to result in the reappearance of the symbiont or the green-spotting property of the insect. Hence it is concluded that the latter is a specific effect of the presence of the associated bacillus.

CHAUDHURI (H.) & SINGH (J.). **A disease of Pomegranate (Punica granatum Linn.) due to Amphichaeta punicae n.sp.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 139–144, 1 pl., 1935.

A brief account is given of a disease which was observed on nursery pomegranate plants in Lawrence Garden, Lahore, and was chiefly characterized by the presence on the twigs of innumerable minute erumpent acervuli with a stroma-like stratum without setae, bearing conidiophores abstricting singly somewhat spindle-shaped, 5-septate spores measuring 20 to 27 by 7 to 11 μ, the four inner cells of which are dark and the two terminal ones hyaline and provided each with a sharply curved cilium (usually towards the same side), measuring 6 to 11 μ in length. The fungus was isolated in pure culture and is considered to be a new species of the genus *Amphichaeta*, for which the name *A. punicae* is suggested. A Latin diagnosis is appended. Numerous inoculation experiments showed that it is a weak wound parasite on pomegranate, which it seldom kills in nature though considerably stunting the growth of the tree.

SCHNICKER (J. L.). **Kemikaliekontrollen i 1934.** [Inspection of chemical substances in 1934.]—*Tidsskr. Planteavl*, xl, 3, pp. 476–490, 1934.

Notes are given on the various offences against the Danish plant protective and poison laws detected in the course of official inspection in 1934 of some 225 samples of fruit tree carbolineum, lime-sulphur, Bordeaux paste and dusts, organic copper- and mercury-containing, and nicotine preparations. In 52 cases it was deemed necessary, in consultation with the public health authorities, to notify the police concerning these infringements, with the result that a number of fines were imposed, ranging from Kr. 20 to 100.

Pflanzenschutzmittelverzeichnis des Deutschen Pflanzenschutzdienstes 1935. Mittel gegen Pflanzenkrankheiten, Schädlinge und Unkräuter. [List of plant protectives of the German Plant Protection Service 1935. Preparations for the control of plant diseases, pests, and weeds.]—*Biol. Reichsanst. Land- u. Forstw., Berl.-Dahl., Merkbl.* 8–9 (10th Ed.), 15 pp., 1935.

Alphabetical lists are given of the preparations officially recognized by the German Plant Protection Service as effective against weeds, plant diseases, and pests (excluding seed-grain disinfectants which form the subject of a separate communication) [*R.A.M.*, xiv, p. 20].

Trappmann (W.). **Schädlingsbekämpfung und Wirtschaftslage. I. II.** [Pest control and the economic situation. I. II.]—*Chem. Z.*, lix, 1, pp. 14–15; 2, pp. 29–30, 1935.

Certain aspects of the agricultural pest control problem are briefly discussed in relation to the present economic situation in Germany.

In connexion with one of the most important branches of plant protection, namely, cereal seed-grain disinfection, it is mentioned that only one (formaldehyde) of the ten liquid disinfectants now officially recommended by the Plant Protection Service for the treatment of wheat bunt [*Tilletia caries* and *T. foetens*] is free from mercury, and only one of the five dusts [*R.A.M.*, xiv, p. 20], all efforts to find a substitute for this costly substance with its attendant risks to health [ibid., viii, p. 300; ix, p. 234] having hitherto failed. The best of the mercury preparations have the advantage of controlling not only wheat bunt, but also the three other chief cereal diseases, viz., loose smut of oats [*Ustilago avenae*], snow mould [chiefly of rye: *Calonectria graminicola*], and barley stripe [*Helminthosporium gramineum*]. Of steadily increasing importance in the business of seed-grain disinfection are the co-operative plants with continuously working apparatus now being established in many parts of the country [ibid., xiii, p. 89].

Hitherto only 60 to 70 per cent. of the total amount of copper sulphate produced annually in Germany (20,000 tons) has been consumed in the home market, the remainder being exported [cf. ibid., ix, p. 118]. It is to be hoped that the quantity of copper sulphate annually required for viticultural purposes (7,000 to 10,000 tons) will continue to be forthcoming, the substitutes employed during the world war, such as peroxide, having proved practically useless. Lime-sulphur is used to a considerable extent in the orchard, especially in humid climates like those of the Lower Elbe and the Lake of Constance, where copper-containing mixtures are liable to cause burning, while sulphur dust or colloidal sulphur preparations are employed against various mildews and the latter as a dormant spray in the orchard. Some 28,000 tons of sulphur being produced annually in Germany, no shortage in the local supply need be feared.

Taubenhaus (J. J.) & Decker (P.). **Laboratory and field studies on sulphur as a fungicide.**—Abs. in *Phytopathology*, xxv, 1, pp. 35–36, 1935.

Sulphurs of a 300-mesh fineness were shown by laboratory studies to be highly inhibitory of spore germination of pathogenic fungi [*R.A.M.*,

ix, p. 664], an effect that may be considerably increased by the addition of small percentages of other standard disinfectants. Sulphur may thus find a valuable use as a carrier in place of the inert material now employed in certain fungicidal and insecticidal dusts. Fair control of potato scab [*Actinomyces scabies*] in Texas was given by the application of sulphur in the furrows with the seed pieces, though not by scattering it broadcast. The passage of *Phymatotrichum* [*omnivorum*: see above, p. 360] from an infected to a healthy area was absolutely barred by the incorporation with the soil of 2 to 4 per cent. sulphur or by pure sulphur slabs.

Goldsworthy (M. C.) & Green (E. L.). **Availability of copper in Bordeaux mixture residues and its absorption by conidia of Sclerotinia fructicola.**—Abs. in *Phytopathology*, xxv, 1, p. 17, 1935.

The available copper in 2–4–50 aged and weathered Bordeaux mixture residues and that absorbed within the germ-tubes of *Sclerotinia fructicola* were determined by the use of nitroso-chromotropic acid. The available copper in such residues was found to amount to at least 4 p.p.m. by volume of the original mixture and to be lethal to germinating and germinated conidia, the growth of which was retarded by smaller quantities of available copper. Once the available copper is washed away, the germinating conidia cannot restore the supply from the remaining insoluble residue, this process being apparently effected by weathering.

Keitt (G. W.) & Palmiter (D. H.). **Fungicidal properties of certain copper-lime-arsenite preparations.**—Abs. in *Phytopathology*, xxv, 1, pp. 23–24, 1935.

The toxicity of copper sulphate, lime, and certain arsenites (especially calcium) in water was studied by a standardized cultural technique in which ten plant pathogens were incubated on plates of malt agar containing the disinfectants. Mono-, di-, and tricalcium arsenite [cf. *R.A.M.*, xii, p. 559], each used alone, were found to equal or exceed copper sulphate in toxicity. The fungicidal efficacy of copper sulphate-lime-calcium arsenite mixtures equalled or surpassed the additive toxicities of the copper sulphate and calcium arsenite used in them, and the toxic materials, as well as those from each of the calcium arsenites used alone, diffused through the agar (especially in initially acid media), whereas the copper-lime component used alone showed no fungicidal action by diffused compounds in alkaline and very little in neutral or slightly acid media.

Roberts (J. W.), Pierce (L.), Smith (M. A.), Dunegan (J. C.), Green (E. L.), & Goldsworthy (M. C.). **Copper phosphate mixture: a promising fungicide.**—Abs. in *Phytopathology*, xxv, 1, pp. 32–33, 1935.

Good control of mild to moderately severe cases of apple scab [*Venturia inaequalis*], cherry leaf spot [*Coccomyces hiemalis*: see above, p. 376], and *Fabraea* leaf blight of pears [*F. maculata: R.A.M.*, xii, p. 231] were obtained in field trials during 1933–4 by spraying with a mixture of 2 lb. copper (tricupric) phosphate, 2 lb. bentonite, and 4 lb.

hydrated lime in 50 galls. water [ibid., xiii, p. 812 and next abstract]. The fruit of certain varieties was slightly russeted by the treatment, but no other injury was caused.

Young (H. C.) & Beckenbach (J. R.). **Insoluble copper compounds as substitutes for Bordeaux.**—Abs. in *Phytopathology*, xxv, 1, p. 40, 1935.

Lack of adhesiveness, the major limitation of copper oxychloride, copper phosphate [see preceding abstract], and coposil [*R.A.M.*, xiv, p. 150] has been found to be largely remediable by the use of bentonite and a specially treated clay known as wyojel. The most effective of the formulas so far tested with promising results on cucurbits in northern Ohio is 1 lb. copper compound, 5 lb. filler, and 1 lb. calcium or lead arsenate. The results of preliminary trials on potatoes and celery indicated that the fungicidal value was decreased by the addition of lime. All these copper compounds caused severe russeting of apples under local conditions.

Horsfall (J. G.) & Hamilton (J. M.). **Some fungicidal possibilities of red copper oxide.**—Abs. in *Phytopathology*, xxv, 1, p. 21, 1935.

Continued trials with red copper (cuprous) oxide [at the New York (Geneva) Agricultural Experiment Station: *R.A.M.*, xiv, p. 218] demonstrated its utility in the control of seed decay, oat smuts [*Ustilago avenae* and *U. kolleri*], wheat bunt [*Tilletia* (?) *foetens*], apple scab [*Venturia inaequalis*], tomato early blight [*Alternaria solani*: ibid., xiii, p. 195], rose mildew and black spot [*Sphaerotheca pannosa* and *Diplocarpon rosae*], and snowberry anthracnose [*Sphaceloma symphoricarpi*: ibid., xii, p. 661]. Generally speaking, it was as safe as Bordeaux mixture, the tendency to injure copper-sensitive plants being reduced, without impairing efficacy, by the addition of lime or cotton-seed oil emulsion. Red copper oxide is strongly adhesive and persistent through rain since it is highly insoluble, is composed of small particles, and probably bears a positive electric charge. Objectionable spray residues are almost eliminated by the high copper content of the molecule. The cheap cuprous ion in cuprous oxide appears to be more toxic to the organisms tested than the cupric ion in general use. Red copper oxide seems to be compatible with the standard insecticides.

Horsfall (J. G.). **Zinc oxide as a seed and soil treatment for damping-off.**—*Bull. N.Y. St. agric. Exp. Sta.* 650, 25 pp., 6 figs., 1934. [Received March, 1935.]

This is a full account [an abstract from which has already been noticed; *R.A.M.*, xiii, p. 388] of experiments at Geneva, New York, the results of which showed that surface applications of zinc oxide at the rate of one-half to one ounce per square foot of ground are a durable means for the control of post-emergence damping-off (*Pythium ultimum*), but should be used as a supplement to seed treatment with red copper oxide [see preceding abstract] for the control of the pre-emergence phase of the disease. As zinc oxide penetrates the soil very poorly it is not effective against pre-emergence damping-off, and furthermore, the seed should not be sown deeper than ¼ inch and the layer of the substance

over the surface should not be disturbed by cultivation until the danger of damping-off is over. Mixing zinc oxide with the surface soil before sowing is not feasible because the dose necessary for disease control is toxic to roots with which it comes in actual contact. In some localities damping-off of transplants was controlled by dusting the foliage of the transplants, immediately after they were set in place, with zinc oxide, and then brushing it off the leaves before rinsing into the soil; this treatment should be applied on cool, cloudy days or late in the afternoon. In 1934 it gave satisfactory control without excessive injury to such plants as tomato, eggplant, chillies, celery, snapdragon, beet, salvia, and wallflower in certain counties, and was stated to control the trouble on rhododendron cuttings, while rhododendron seedlings were injured in a greenhouse in another locality.

While in general zinc oxide appeared to be less effective than red copper oxide when used for seed treatment, it was more effective than the latter for some seeds, particularly crucifers and lettuce in certain localities, and it compared favourably with semesan on cabbage seed at Geneva.

Dorph-Petersen (K.). **Beretning fra Statsfrøkontrollen for det 63. Arbejdsaar fra 1. Juli 1933 til 30. Juni 1934.** [Report of the State Seed Testing Service for the 63rd year of activity from 1st July, 1933 to 30th June, 1934.]—*Tidsskr. Planteavl*, xl, 3, pp. 399–459, 1934.

Section vi of this report (pp. 435–6) contains a few items of phytopathological interest regarding the presence of seed-borne parasitic fungi in seed samples in Denmark [cf. *R.A.M.*, xii, p. 294], none of which calls for special mention.

Canna (S.). **Ricerche sulla flora micologica dei lieviti della panificazione.** [Studies on the mycological flora of the leavens used in bread-making.]—*Boll. Soc. ital. Biol. sper.*, ix, 4, pp. 335–337, 1934.

The following organisms were isolated from numerous samples of natural leavens obtained from various sources in Tuscany: *Actinomyces albus* [*R.A.M.*, xi, p. 325], *Saccharomyces cerevisiae* [ibid., viii, p. 778; xiv, p. 306], *S. minor*, *Aspergillus calyptratus* var. *italicus*, *Coremium* [*Penicillium*] *glaucum*, *Cryptococcus* sp., *Enantiothamnus braulti* Pinoy [ibid., xii, p. 288; cf. also xiii, p. 186], *Geotrichum candidum* [ibid., ix, p. 201], *Monilia candida* [*Candida vulgaris*], *M. lustigi* Cast., *P. crustaceum*, and *Sterigmatocystis nigra* [*A. niger*]. The so-called 'compressed' or 'selected' leavens (Italian and foreign), supplied by sugar and alcohol factories and consisting of actively fermenting cultures of *Saccharomyces cerevisiae* on cereal or other starchy media, also contained *G. candidum*, a red pigmented strain of *Cryptococcus*, *Monosporium spinosum*, *P. glaucum*, and *Trichosporium fuscum*. Fermentation of various sugars with gas production was effected by ten of the above-mentioned species.

Bisby (G. R.). **Are living spores to be found over the ocean?**—*Mycologia*, xxvii, 1, pp. 84–85, 1935.

During a voyage from Montreal to London occupying the period from

25th May to 4th June, 1934, the writer exposed Petri plates with a view to determining the incidence of living fungal spores over the sea. After leaving the St. Lawrence River and Gulf, which yielded three or four [unspecified] micro-organisms, no fungi were caught on the plates until the south coast of Ireland was reached on 2nd June; of the four then secured, one was *Botrytis cinerea* and the other *Phoma* (?)*hibernica* [ibid., xiii, p. 97]. Further [undetermined] organisms developed from plates exposed in the English Channel.

It would appear from these data that the scarcity of micro-organisms over the sea is such as to necessitate special arrangements for the protracted exposure of plates and slides.

MEIER (F. C.). **Micro-organisms in the atmosphere of Arctic regions.**—Abs. in *Phytopathology*, xxv, 1, p. 27, 1935.

On the Lindbergh Atlantic Survey Flight of 1933, 26 collections of organisms present in the atmosphere at various altitudes over stretches of water and ice between Maine and Denmark were obtained on specially prepared slides. The results showed an abundance of certain spore types in the air currents over Maine and Labrador, diminishing with the leeward progress over Davis Strait, the great ice cap of Greenland, and Denmark Strait [cf. *R.A.M.*, xiv, p. 326, and preceding abstract].

BABEL (A.). **Infrarot-Photographie im Pflanzenschutz.** [Infra-red photography in plant protection.]—*Angew. Bot.*, xvii, 1, pp. 43–53, 9 figs., 1 graph, 1935.

The application of infra-red photography [*R.A.M.*, xiii, p. 47] to the study of plant diseases is discussed in connexion with some typical examples, and the principles and technique of the process are fully described.

RIVERA (V.). **I virus filtrabili nella patologia vegetale.** [Filterable viruses in plant pathology.]—*Mem. R. Ist. sup. agr. Perugia* 45, 47 pp., 4 figs., 1934.

After discussing the nature of virus diseases and the effects exercised upon them by the temperature of the air and other environmental conditions, the author describes a series of experiments in which young leaves of healthy Kentucky tobacco plants were inoculated with *Bacterium tumefaciens* and the virus of Dickson's and Vanterpool's tomato streak (a mixture of tobacco mosaic and the latent potato virus) [*R.A.M.*, xii, p. 333; xiv, p. 201] singly and together. Inoculations with the viruses alone produced streak symptoms only, those made with the bacterium alone or the bacterium with the juice of an apparently healthy tobacco plant led to the formation of galls, while those made with *Bact. tumefaciens* and the streak viruses (in the same wound) gave symptoms of virosis followed by an extremely rapid formation of galls bearing normally growing tobacco shoots. When well-formed, actively growing galls were painted with the juice expressed from streak-diseased tobacco plants their growth was arrested and their size reduced, the streak virus mixture exercising a necrotic effect on the gall tissues. Spectroscopic

examination showed that the juice from streak-diseased tobacco plants was unable to absorb ultra-violet rays.

CHESTER (K. S.). **Serological evidence in the study of the relationships of certain plant viruses.**—Abs. in *Phytopathology*, xxv, 1, p. 10, 1935.

So close is the serological relationship between twenty-five yellow, white, necrotic, symptomless, and ordinary strains of the tobacco mosaic virus that they may be regarded merely as minor variants of a single type. To the same serological group belong also aucuba mosaic of tobacco and Johnson's virus No. 6 [*R.A.M.*, xiv, p. 261]. Cucumber mosaic and tobacco ring spot, both entirely distinct from tobacco mosaic, are readily distinguishable from one another by the neutralization test, and each comprises strains closely related serologically among themselves [ibid., xiv, p. 245]. The latent virus of potato [ibid., xiv, p. 261 and preceding abstract] differs serologically from all the above-mentioned viruses, and is very closely allied to potato ring spot, mottle [ibid., xii, p. 588; xiii, p. 319], and British Queen streak [cf. ibid., xiii, p. 329], the three last-named behaving as strains of the latent virus. The veinbanding [ibid., xiv, p. 190] and aucuba mosaic [ibid., xii, p. 585] potato viruses were found to be entirely distinct both from each other and from all those mentioned above.

HARRISON (A. L.). **The effect of mosaic on transpiration of the Bean.**—Abs. in *Phytopathology*, xxv, 1, p. 18, 1935.

The rate of transpiration in mosaic Stringless Green Pod Refugee beans (*Phaseolus vulgaris*) [*R.A.M.*, xiv, p. 72] in New York was found to be significantly less per unit of surface area and dry weight than in healthy plants. The rate was slower in leaves with primary symptoms than in those with secondary ones, and in the light than in the dark green areas. The rate in leaves formed before infection was not altered. Detached pods from diseased plants transpire more rapidly per unit of surface area and fresh weight than those from healthy ones.

BALDACCI (E.). **L'immunità acquisità attive nella piante superiore: I. Esperienze di vaccinazione. II. Ricerche sulla vaccinazione e sui liquidi usati come vaccini. III. Critica del concetto di vaccinazione e dei procedimenti tecnici.** [Acquired active immunity in the higher plants. I. Vaccination experiments. II. Studies on vaccination and on the liquids used as vaccines. III. A critique of the concept of vaccination and of the technical methods.]—*Boll. Soc. ital. Biol. sper.*, ix, 8, pp. 744–746; 10, pp. 1232–1235, 1934.

Rice seedlings were subjected [by methods similar to those previously described: *R.A.M.*, xii, p. 779] to artificial immunization against *Corticium centrifugum*, *C.* (*Sclerotium*) *rolfsii* [ibid., xiv, p. 196], and three strains of *S. oryzae* [*Leptosphaeria salvinii*: ibid., xiii, p. 653]. In general, the results of these tests can hardly be considered to support the claims in favour of vaccination advanced from various quarters [cf. ibid., xiv, p. 188]. Such benefit as accrued to the treated plants (mainly from the mycelial extracts of the fungi, though the filtrate was also effective in the case of *C. centrifugum*), was of a purely transitory nature

and did not prevent their collapse simultaneously with, or even before, the untreated controls. A statistical analysis of the experimental data indicates a positive result in favour of the vaccinated plants on the tenth day in the cases of *C. centrifugum*, *C. rolfsii*, and *L. salvinii* (strain II), whereas on the twentieth day only the plants treated with *C. rolfsii* were in slightly better condition than the controls.

In a further test, in which rice seedlings were grown after vaccination and inoculation in Sachs's medium plus saccharose without agar, an enhanced degree of resistance as compared with the controls was temporarily shown by those treated with the filtrate (1:100) of *C. centrifugum*. In tests with *L. salvinii* (strain I.M.I. from the C. v. S., Baarn) all the plants died at the same time, while in those with the other organisms the controls were the last to succumb. In a third trial the seedlings were grown for indefinite periods in the vaccines: on the thirtieth day the incidence of mortality was 41 per cent. for *C. rolfsii*, 41·6 per cent. for *L. salvinii* II, 53·8 per cent. for *C. centrifugum* and *L. salvinii* I.M.I.; and 61 per cent. for Curzi's strain of the last-named fungus; on the fiftieth day 84 per cent. of the plants were dead. Calculating by dilutions, the mortality on the thirtieth day among the plants treated with the 1:10 concentration was 71·4 per cent., the corresponding figures for 1:50, 1:100, and mycelial extract (1:100) being 40, 13·3, and 68 per cent., respectively.

In connexion with a brief discussion on the theory and practice of vaccination (with special reference to absorption of the vaccines through the root system), the writer propounds the hypothesis that the resultant temporary retardation of decay is associated with diminished transpiration and a consequent prolongation of the turgor necessary for mechanical resistance to hyphal penetration [cf. ibid., vii, p. 799].

Smith (Elizabeth C.). **Effects of ultra-violet radiation and temperature on Fusarium. I. Lethal action.**—*Bull. Torrey bot. Cl.*, lxii, 1, pp. 45–58, 2 graphs, 1935.

As a result of her experiments with water suspensions of *Fusarium eumartii* spores, the author states that the death rates of the spores subjected to ultra-violet radiation [cf. *R.A.M.*, xii, p. 316] at different temperatures took the form of sigmoid curves which rapidly approached the logarithmic type as the temperature was increased, a factor which increased the lethal effect of the radiation especially on the least resistant spores. The average temperature coefficients between 0° and 40° C. and between 40° and 50° (1·13 and 1·37, respectively) are characteristic of a physical or photochemical reaction, with an indication that temperature, besides a sensitizing effect, has also a lethal action in conjunction with ultra-violet radiation, in the presence of which its effect is relatively constant. The mycelium of *F. eumartii* was shown to be less sensitive to the radiation than the spores, but no difference in this respect was observed between germinating and resting spores.

It is suggested that in such tests sigmoid curves are due to chance variation in resistance of the spores to the lethal agent, and that logarithmic curves are only modified sigmoid curves in which the death-rate has increased most for the least resistant spores.

CARTER (J. C.). **Growth association of micro-organisms.**—Abs. in *Phytopathology*, xxv, 1, p. 9, 1935.

Helminthosporium sativum, *H. inaequale* [*Curvularia inaequalis* (Shear) Boedijn], *Sclerotinia americana* [*S. fructicola*], *Glomerella cingulata*, *Gibberella saubinetii*, *Fusarium moniliforme* [*G. moniliformis*], *F. conglutinans*, and *F. lycopersici* were each grown in culture on potato-dextrose agar with various bacteria, *Aspergillus niger*, and two strains of *Penicillium* [cf. *R.A.M.*, xii, p. 109] as inhibitors. *A. niger* was the only one of the inhibitors to produce even a slight retardatory effect on *G. moniliformis*, while *F. conglutinans* and *F. lycopersici* also proved refractory to inhibition by other organisms. *H. sativum* was the most sensitive of the fungi, being inhibited at a distance of 15 to 25 mm. by three bacteria and *A. niger*, the corresponding figures for *C. inaequalis* and *S. fructicola* being 10 to 15 and 5 to 10 mm., respectively.

GOTO (K.). **Observations on spore discharge in perfect stage of Sclerotium rolfsii Sacc.**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 609–618, 2 diags., 1934.

The basidiospores of the perfect stage of *Sclerotium rolfsii* [*R.A.M.*, xiv, p. 125 and below, p. 399] were observed to be violently discharged from the sterigmata to a distance of about 0·2 mm. A simple apparatus was devised for the continuous recording of the spore discharge, the periodicity of which was found to reach a maximum at a time distant from noon and a minimum round about mid-day. Spore discharge is more profuse at 15° to 21° than at 22° C., while at 34° it no longer occurs. The process is dependent on a high degree of atmospheric humidity; even at 97 per cent. it declines during the second twelve hours, while at 75 per cent. it ceases after four or five.

WARTENBERG (H.), KLINKOWSKI (M.), & HEY (A.). **Der Tagesparzellenversuch. Beiträge zur Methodik der Kartoffelabbauforschung.** [The day plot experiment. Contributions to the technique of Potato degeneration research.]—*Angew. Bot.*, xvii, 1, pp. 74–94, 2 graphs, 1935.

An explanatory account is given of the so-called 'day plot experiment', a development of the 'origin test' forming the basis of ecological potato degeneration research in Germany [*R.A.M.*, xiv, p. 54]. From May to August, 1933, healthy material of the Magnum Bonum and Parnassia varieties was planted out at two- to three-day intervals, the tubers harvested in the autumn, and planted out in the following spring. The resulting stands showed differences in the amount of basal roll, leaf roll, and crinkle coinciding with the variations in the absolute atmospheric humidity prevailing during the planting times in the previous year.

Potato degeneration is considered to be a complex pathological manifestation, the expression in the first instance of a physiological disease—a metabolic anomaly induced by environmental conditions. In certain varieties this disordered metabolism is sufficient in itself to produce progressive degeneration and eventual death, which may be averted, however, before the final stages are reached, by the provision of a suitable environment. It may be assumed that potato plants

weakened by a primary physiological disease are predisposed to attack by infectious viruses. Certain varieties, however, appear to possess, even in a physiologically pathological condition, inherent immunity from virus infection. Potato degeneration may thus eventually result from a leaf roll arising from ecological conditions and a virus component.

Köhler (E.) & Hey (A.). **Untersuchungen an Kartoffelproben über die Beziehungen zwischen Knollenpotential und Virusbefall.** [Investigations on Potato samples on the correlations between tuber potential and virus infection.]—*Zbl. Bakt.*, Abt. 2, xci, 11–15, pp. 256–267, 1 fig., 1935.

Further experiments [the results of which are discussed and tabulated] on the application of Wartenberg's and Hey's potentiometric method to the diagnosis of degeneration diseases of the potato [*R.A.M.*, xiii, p. 649] substantiated previous data as to the validity of this mode of testing. The cause of alteration in the potential lies, not in the virus itself, but in the metabolic disturbances which it induces in the tuber [cf. ibid., xiv, p. 328]. Judging by the outcome of these trials on the Industrie, Magnum Bonum, Klein-Spiegeler Wohltmann, and Preussen varieties, the most prevalent and important viruses in Germany are leaf roll and mosaic of the X and Y groups (ring and streak) [ibid., xiii, p. 797].

Köhler (E.). **Mischinfektionen mit verschiedenen Stämmen des Ringmosaikvirus (X-Virus-Gruppe) der Kartoffel. (Untersuchungen über die Viruskrankheiten der Kartoffel. IV. Mitteilung.)** [Mixed infections with various strains of the ring mosaic virus (X virus group) of the Potato. (Investigations on the virus diseases of the Potato. Note IV.)]—*Angew. Bot.*, xvii, 1, pp. 60–74, 5 figs., 1935.

It has previously been shown [*R.A.M.*, xiii, p. 462] that tobacco and other Solanaceae when systemically infected by a weak strain of the ring mosaic (X) virus [ibid., xiv, p. 327] do not ordinarily contract infection from another, stronger strain of the same group. Further experiments were carried out to ascertain the extent of this protective mechanism and the possibilities of its failure under certain conditions.

Samson Turkish tobacco plants were inoculated either by rubbing the leaves with a glass spatula dipped in the virus (Samuel's method) [ibid., xi, p. 334], or by grafting. The following strains were used as inoculum: Ers. 25 from a healthy Duke of York (Erstling) potato, characterized by the extreme brilliance of the large, milky-white mosaic areas and virtual absence of necrosis, presumably identical with K. L. Koch's mottle virus [ibid., xii, p. 588]; Mb. 12, an exceptionally weak strain from Magnum Bonum, producing after the lengthy incubation period of 18 days a very inconspicuous mottling, largely masked during the winter (ring spot type) [loc. cit.]; and H. 19 described in the previous paper.

Mb. 12 was found to exert a well-marked protective action against H. 19 in the rubbing tests, but it was powerless to counteract the more virulent strain in cases where scions permeated with Mb. 12 were grafted on stocks heavily infected with H. 19. Evidently the protective mechanism of the first virus breaks down under conditions affording the second

direct access to the phloem. It was shown by further rubbing experiments that Mb. 12 is also incapable of immunizing the plants against Ers. 25, while H. 19 likewise maintained its virulence in the presence of Ers. 25. In these cases the lack of protection may be due to the inclusion of two types (mottle and ring spot) within the ring mosaic (latent) virus, Ers. 25 representing the former and H. 19 and Mb. 12 the latter, the immunizing capacity of each type being strictly specific.

Esmarch (F.). **Die Eisenfleckigkeit der Kartoffeln.** ['Eisenfleckigkeit' of Potatoes.]—*Kranke Pflanze*, xii, 1, pp. 7–10, 1935.

The writer summarizes the available information in respect of 'Eisenfleckigkeit' of potatoes [*R.A.M.*, xiv, p. 117], with special reference to the investigations of Meyer-Hermann in Germany [ibid., xii, p. 652].

Darling (H. M.), Leach (J. G.), & Krantz (F. A.). **Scab resistance in Potato seedlings.**—Abs. in *Phytopathology*, xxv, 1, pp. 13–14, 1935.

Resistance to scab (*Actinomyces scabies*) in the potatoes commonly grown in the United States [*R.A.M.*, xiv, p. 118] occurs only in those with thick or russet skins, but a series of tests in Minnesota during the last three years showed that some smooth- and thin-skinned inbred seedlings of varying origin also possess this character. Histological studies denote that resistance is closely connected with the capacity for suberization in the lenticels and the type of cells in the latter, the smaller and more compact cork cells apparently conducing to resistance [cf. ibid., xi, p. 69]. Some of the inbred resistant seedlings yielded almost exclusively resistant offspring, but others, as well as some susceptible seedlings, gave both resistant and susceptible plants.

Braun (H.). **Erbanalytische Studien über das Verhalten der Kartoffel gegenüber Synchytrium endobioticum (Schilb.) Perc.** [Genetic-analytical studies on the reaction of the Potato towards *Synchytrium endobioticum* (Schilb.) Perc.]—*Angew. Bot.*, xvii, 1, pp. 54–59, 1935.

The 4,413 potato seedling strains tested by the writer at Berlin-Dahlem for their reaction to wart disease (*Synchytrium endobioticum*) may be divided into three groups. The first (susceptible × susceptible) comprised 22 families, of which 16 originated through selfing and 6 by crossing among a number of standard varieties. In most of the families (including all the crosses) susceptible strains predominated in the progeny, two crosses, in fact, yielding exclusively susceptible offspring. There is thus no doubt that certain varieties are homozygous for susceptibility, but it is equally clear that Jørstad and Lunden are incorrect in their assertion that susceptible varieties produce nothing but susceptible progeny [*R.A.M.*, xi, p. 669; xiv, p. 252]. In certain families there may be a considerable number of resistant individuals—exceeding in some cases that of the susceptible. This interpretation of the data is in line with Salaman's and Lesley's assumption [ibid., iii, p. 170] as to the two types of susceptible strains, viz., those yielding only susceptible offspring and others producing a smaller or larger number of resistant seedlings.

The second group (resistant × resistant) contained 40 families (28 selfed and 12 crosses), and in this case the observations of Salaman and

Lesley regarding the occurrence among the progeny of exclusively resistant types could not be confirmed. The majority of the F_2 families were composed to the extent of 50 per cent. or more of resistant individuals, but in eight less than half the offspring were resistant—only 24·6 per cent. among the 73 strains of Switez.

In the third group (resistant × susceptible) resistance and susceptibility were about equally balanced in the progeny.

Briefly discussing these data in connexion with the problem of the genetic constitution of the potato, the writer emphasizes the impossibility of drawing a definite conclusion on the basis of insufficient material. The results hitherto obtained, however, incline him to support K. O. Müller's polyploid hypothesis, framed on the outcome of his studies on resistance to *Phytophthora* [*infestans*: ibid., x, p. 546].

Müller (K. O.). **Über den augenblicklichen Stand unserer Kenntnisse zur biologischen Spezialisierung des Krautfäuleerregers der Kartoffel (Phytophthora infestans).** [On the present position of our knowledge of the biological specialization of the agent of Potato late blight (*Phytophthora infestans*).]—*Züchter*, vii, 1, pp. 1–12, 1 map, 1935.

After summarizing the results of previous studies on biologic specialization in *Phytophthora infestans* in Germany [*R.A.M.*, xiii, p. 259], the writer describes further investigations on the reaction to the now well-established A and S forms of the fungus of (1) the so-called central European assortment of some 360 standard potato varieties (German and foreign); (2) Broili's Ef strain [ibid., xiii, p. 53], the ancestor of the W potato races; and (3) the important breeding species *Solanum demissum* and its hybrids with cultivated types.

Five strains of these biologic forms of *P. infestans* were tested on tubers of the standard assortment, three A and two S types. With one exception (a cross between a W and a cultivated form), all the commercial varieties proved more or less susceptible to both A and S; on tubers of Odenwälder Blaue, however, the A types produced rapid necrosis of the tissues and diminished sporing, resembling the effect found at times to be caused by this type in the W varieties. Some of the A types attacked the tubers of semi-resistant W_2 and W_3 groups with varying degrees of severity (though the fungus fructified sparingly), but in all cases they caused little or no damage to those of the highly resistant W_1 group. None of the W forms, however, showed any conspicuous degree of resistance to the S type; they cannot, therefore, be used in the development of S-resistant strains. Very different results, on the other hand, were obtained with *S. demissum* and its F_1 hybrids with cultivated varieties [ibid., xiii, p. 652], which uniformly showed a high degree of resistance to both the A and S types.

At least two biotypes were found to be comprised in the isolations of *P. infestans* from tomato, of which one (T) is stated to represent an entirely new form, behaving like A on potato but attacking all varieties of tomato hitherto tested with much greater severity than the potato strains. The second form (L) isolated from tomato causes relatively mild symptoms on its own host, moderate infection on cultivated potatoes, and little or none on the W forms, whence it is inferred to be identical with A.

Sporangial development is more profuse than aerial mycelial growth in representatives of the A group, while in S the relationships are exactly reversed.

The examination of potato samples from over 450 localities in Germany showed that the A type (including those forms capable of attacking W_2 and W_3 tubers but not foliage) predominates throughout the country. The S type occurs in seven localities of Pomerania, Bavaria, and the Odenwald, of which three were known in 1932 and the rest discovered in 1933; in all these regions the W forms have been in cultivation for fairly lengthy periods. As far as can be judged on the basis of available information, type A also predominates in the United States, Holland, England, and Japan.

From the standpoint of practical potato breeding, the fact that the W forms are liable to infection by the S type of *P. infestans* disqualifies them from further extensive cultivation as a solution of the late blight problem. There are possibilities, however, in hybridization between *S. demissum* and the cultivated potato and perhaps also in other lines of approach requiring further investigation.

ORTH (H.) & LEHMANN (H.). **Über Degenerationserscheinungen bei Phytophthora infestans.** [On degeneration phenomena in *Phytophthora infestans*.]—*Züchter*, vii, 1, pp. 12–16, 6 graphs, 1935.

Full details are given of observations and inoculation experiments with two German strains of *Phytophthora infestans* (A type) [see preceding abstract] showing that protracted culture of the fungus on potato tubers leads to a marked decline in viability proportionate to the duration of growth on a comparatively uncongenial substratum. Normal germinative capacity may be restored by transference of the cultures to foliage, a process that is absolutely essential to the success of inoculation experiments whenever viability sinks below 50 per cent. To this end the capacity of the sporangia in tuber cultures for zoospore formation should be regularly tested.

CROSIER (W.) & REDDICK (D.). **Some ecologic relations of Phytophthora infestans.**—Abs. in *Phytopathology*, xxv, 1, p. 13, 1935.

The most important external factors in the rapid dissemination of potato late blight (*Phytophthora infestans*) are temperature and humidity [*R.A.M.*, xiii, p. 724]. A relative humidity of 95 per cent. or above must be maintained for some eight hours to permit the formation of viable sporangia; and it must persist for at least eleven or twelve hours, with liquid water and temperature optima for germination, swarming, and infection at the proper moments, to allow of infection taking place. Aerial transmission of the spores cannot explain the spread of the disease over vast tracts. The direct infection of new tubers from diseased seed pieces occurs in sufficient amount to account for the wide prevalence of *P. infestans* following a year of no foliage attack.

DENNISTON (L. T.). **The relation of spraying and disease-free seed to high yields in Pennsylvania.**—*Amer. Potato J.*, xii, 1, pp. 14–18, 1935.

The writer tabulates and discusses the results of his analyses of ten

years' statistics (1925–34) on the relation of spraying and healthy seed to high potato yields in Pennsylvania.

The number of spraying apparatus in use in the State is 12,000; dusting is practised by a small number of growers, but the difference of 50·3 bushels per acre on 35 demonstrations in favour of spraying accounts for the wider popularity of liquid treatment. The average increase in yield on 2,713 spray demonstrations during the past 17 years has been 83·3 bushels per acre, while 771 in the last ten years gave slightly over 100. These results are stated to have been almost as consistent in dry years, such as 1934, with little or no late blight [*Phytophthora infestans*], as in epidemic seasons.

During the period 1919–34 the average increase in yield per acre on 2,446 demonstrations as a result of using disease-free seed was 51·2 bushels (25·4 per cent.).

The average number of sprays applied by all persons obtaining over 400 bushels per acre from 1925 to 1934 was 10·1, the corresponding figures for over 500, over 600, ten extra high yields, and the State record yield being 11·7, 13·3, 14·6, and 13, respectively. The average pressures for the five groups were 302, 345·1, 347·6, 360, and 400 lb., respectively, and the average number of growing days 143, 147, 157, 166 and 172, respectively.

Kubiena (W.). & Renn (C. E.). **Micropedological studies of the influence of different organic compounds upon the microflora of the soil.**—*Zlb. Bakt.*, Abt. 2, xci, 11–15, pp. 267–292, 3 pl., 2 diags., 1935.

Full details are given of the methods and results of 'micropedological' studies ('direct microtechnical investigations of undisturbed, naturally developed soils') on the influence of the addition of finely divided cellulose, lignin, zein, and gum arabic to a podsol soil at the New Jersey Agricultural Experiment Station. The soil microscope used was designed by W. Kubiena [cf. *R.A.M.*, xii, p. 191] and manufactured by Reichert of Vienna, while the photographs were taken with Czerny's microcamera, supplied by the same firm.

The addition of cellulose stimulated microbic activity within one day, while on the third day mycelial development was most marked in the zein-treated soil. An *Actinomyces* of the *chromogenes* type [ibid., ix, p. 525] predominated in this soil. Soils enriched by each of the four above-mentioned elements contained *Gliocladium* sp. and *Verticillium chlamydosporum*, which were also found in those without any added constituent. *Hyalopus* sp. and *Cumminghamella* sp. occurred in soil with zein, and a yellow *Humicola* sp. predominated on the surface of that with cellulose. On the eighth day the soil with gum arabic showed much *Penicillium* infection, which was absent from the other series at this time. *Botrytis cinerea* was detected sporadically in soil with lignin and *G. roseum* and *P. lilacinum* [ibid., xi, p. 325] in that with zein.

Some general considerations arising out of these results are advanced, and the conclusion is reached that the micropedological method forms an indispensable adjunct to the plate and culture technique [ibid., xiii, p. 471], without, however, superseding the latter.

STEENBJERG (F.). **Undersegelser over Manganindholdet i dansk Jord. II. Det ombyttelige Mangan og dets Afhaengighed af Gødskning og Jordbehandling.** [Investigations on the manganese content of Danish soil. II. The exchangeable manganese and its dependence on fertilizing and soil treatment.]—*Tidsskr. Planteavl*, xl, 3, pp. 337–365, 1 fig., 2 graphs, 1934. [English summary.]

It is already known from the work of the writer and others that grey speck of oats and other agricultural crops in Denmark is due to a deficiency of exchangeable manganese in the soil [*R.A.M.*, xiv, p. 121]. In the present paper details are given of pot experiments in 1933–4 with Victory oats in which various reducing agents were applied in increasing amounts to the soil about a week before sowing with a view to counteracting the trouble, which is stated to be of considerable economic importance in the northern and western parts of Jutland. Other pots received finely powdered manganese dioxide and manganous sulphate for comparison. Quinone, quinhydrone, hydroquinone, sodium sulphite, metol (agfa), formaldehyde, and potato starch gave partial or complete control of the disorder. Waterlogging, which behaves like reducing agents in increasing the amount of exchangeable manganese, had no beneficial effect, and saccharose also failed. The residual effects of manganese dioxide and sodium sulphite in 1934 were inconsiderable and nil, respectively. All the agents giving an increased yield increased the manganese 'value' of the soil and the absorption of manganese by the plant.

The second part of the paper is concerned with the mathematical expression of the quantitative relationship between added and exchangeable water-soluble cations, the close agreement between observed and calculated values being shown by means of experiments with potassium and manganous ions added to given amounts of soil under controlled conditions. An equation which may be used to determine the 'manganese requirement' of the soil is given.

HILDEBRAND (A. A.). **Root rot of Ginseng in Ontario, caused by members of the genus Ramularia.**—*Canad. J. Res.*, xii, 1, pp. 82–114, 3 pl., 2 figs., 1 graph, 1935.

The more destructive of the two diseases of ginseng (*Panax quinquefolium*) roots in Ontario [*R.A.M.*, viii, p. 402] is locally known as the 'disappearing rot' and is characterized by a soft rot which may destroy the roots or reduce them to a peridermal shell enclosing fragments of vascular tissue. It is caused by at least three species of *Ramularia*, *R. panacicola* Zins., *R. mors-panaci* n.sp., and *R. robusta* n.sp. English technical descriptions and Latin diagnoses of the new species are given. In culture *R. mors-panaci* forms an abundant, loose, at first white and later brown aerial mycelium; the septate conidiophores are simple or branched and bear hyaline, ovoid or short-cylindrical to fusiform or long narrow-cylindrical conidia, uni- (mostly) to bicellular, not constricted at the septum, and 4·6 to 50·8 (mostly 5 to 19) by 2·1 to 5·1 μ in diameter. Intercalary, dark-brown chlamydospores, 7·8 to 23·4 μ, are formed in chains or pseudo-sclerotial masses. The aerial mycelium of *R. robusta* is at first white then buff-brown, sparse, or forming a thin seal-brown stroma. The conidia are hyaline, the smaller ones ovoid to broadly

cylindrical, abstricted from simple to sparingly branched conidiophores and often adhering in small, gelatinous heads; the larger, broadly cylindrical, clavate, mostly slightly curved, 0- to 8-septate (55 per cent. 0-septate, 33 per cent. 1-septate, 5 per cent. 2-septate, 5 per cent. 3-septate), and 3·1 to 122 by 1·4 to 9·1 μ (over 92 per cent. not exceeding 65 μ in length). Intercalary, buff-brown chlamydospores, up to 14·5 μ in diameter, are formed in old cultures.

Although the cause of the second disease (locally named 'rust' and marked by superficial, rust-coloured lesions on the roots) has not yet been definitely established, some experimental results, coupled with indirect evidence, would suggest that three of the five forms of *Ramularia* isolated from the lesions (all different from those mentioned above) may bear a causal relation to it.

Cross-inoculation experiments with these forms and also with a number of strains of *Ramularia* from similar lesions on other hosts indicated both variations in pathogenicity and specificity in host relationships. The genus *Ramularia* is evidently an important member of the group of facultative parasites associated with root diseases.

Crop rotation and strict field sanitation are the only measures recommended for the control of the two ginseng root diseases, to which no varieties have been found resistant.

Tims (E. C.). **Severe type of mosaic on a Sugar-cane variety.**—Abs. in *Phytopathology*, xxv, 1, pp. 36–37, 1935.

Of the two mosaic types affecting the C[anal] P[oint] 28–70 sugar-cane variety in Louisiana [*R.A.M.*, xiv, p. 123], one causes much more severe injury than is usually found in mosaic disease, producing a very conspicuous, yellow mottling and decrease in size of the leaves. Yield tests showed that this type reduced tonnage and sucrose content of the juice by 32 and 20 to 30 per cent., respectively. The yellow virus is transmissible to other varieties, which develop mild symptoms resembling those of the ordinary green type.

Cross (W. E.). **Ensayos y observaciones relativos al efecto del mosaico sobre los rendimientos culturales de las variedades P.O.J. 36, 213, y 2725.** [Experiments and observations relative to the effect of mosaic on the cultural yields of the varieties P.O.J. 36, 213, and 2725.]—*Rev. industr. agríc. Tucumán*, xxiv, 3–4, pp. 57–76, 1934. [Received April, 1935.]

The results [which are fully tabulated and discussed] of observations and experiments on the effect of mosaic on the yield of the sugar-cane varieties P.O.J. 36, 213, and 2725 in Tucumán, Argentina, indicated that the two first-named have acquired so high a degree of tolerance to the disease during their twenty years of cultivation in the province that they suffer no loss of productivity [*R.A.M.*, xii, p. 463]. There was practically no difference between the yields of healthy P.O.J. 2725 [see below, p. 397] and the same heavily infested by mosaic.

Desai (S. V.). **The antigenic properties of the Sugar-Cane mosaic virus.**—*Curr. Sci.*, iii, 7, p. xviii, 1935.

In serological tests with anti-sugar-cane mosaic and anti-healthy

juice sera, in which rabbits were immunized by intravenous inoculations with Chamberland candle filtrates of mosaic and healthy leaf juices, the anti-mosaic serum inactivated the mosaic leaf juice while the anti-healthy serum had no effect, this result being confirmed by the fact that all the plants inoculated with the anti-mosaic serum and the mosaic leaf juice mixture remained healthy while those inoculated with the mixture with anti-healthy serum became infected. Precipitation tests with the anti-mosaic serum gave a positive reaction with mosaic leaf juice and a negative one with healthy leaf juice, the anti-healthy serum being faintly positive to both.

Desai (S. V.). **A new disease of Sugar-Cane.**—*Curr. Sci.*, iii, 7, p. xviii, 1935.

Sugar-canes at Musheri research station, India, developed a disease during the rainy season which is termed 'stinking rot' and is characterized by wilting and a rapid rotting from the top downwards, accompanied by an unpleasant odour. A pathogenic bacterium of the *Bacillus pyocyaneus* group [*R.A.M.*, xiv, p. 16] was isolated from affected material, and found to differ from *Phytomonas* [*Bacterium*] *anthochlorum*, *Bact. aptatum* [ibid., viii, p. 478], and *Bact. marginale*, which represent the allied plant-pathogenic types of this group. It was associated with a saprophytic organism, and combined inoculations with the two were much more effective in causing the disease than cultures of the pathogenic type only. Pathogenicity appeared to be confined to sugar-cane.

Matsumoto (T.) & Yamamoto (W.). **Three important leaf spot diseases of Sugar Cane in Taiwan (Formosa).**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 584–598, 1 col. pl., 4 figs., 1934. [Received March, 1935.]

A brief report is given of the authors' investigations in the field and laboratory of the three most important leaf diseases of the sugar-cane in Formosa. The first appears not to have been described hitherto, although it has been very prevalent in the eastern part of the island for years. It is characterized by the appearance on the young foliage and on the still unfurled leaves in the spindle of small, narrow, elliptical or longitudinally elongated, yellowish spots with red inclusions, which are visible on both sides of the leaf and are 2 to 10 by 1 to 1·5 mm. in diameter. The lesions gradually expand, turn reddish-brown, and in time involve the whole leaf surface, the original spots at this stage being still distinguishable as somewhat straw-coloured areas. With a lens the spots are seen to be overrun on both surfaces by numerous loosely-branched fungal hyphae, with single (never fasciculate) conidiophores arising at right angles from them. Histological examination showed that the external hyphae emerge from the stomata and may re-enter others at some distance. The internal hyphae may grow intercellularly, but most of them penetrate the cell walls, and occur in the bundle sheath, the parenchyma, and the xylem, though not in the fibres. The external hyphae are hyaline to subhyaline, more or less verrucose, and 1·5 to 2·5 μ in diameter. The conidiophores are pale olivaceous to olivaceous-brown, simple, straight, slightly geniculate, 0- to 6- (mostly 2- or 3-) septate, and 7 to 55 (mostly 16 to 29) by 2·5 to 4 μ. The conidia are

obclavate-filiform, tapering towards the apex, straight or slightly curved, hyaline to subhyaline, 2- to 15- (mostly 5- to 8-) septate, not distinctly constricted at the septa, and measure 29 to 153 (mostly 62 to 91) by 2·5 to 3·7 μ. The fungus is considered to be a hitherto undescribed species of *Cercospora*, for which the name *C. taiwanensis* (with Latin diagnosis) is provisionally suggested until further studies finally determine its taxonomic status. The pathogenicity of the fungus to sugar-cane was proved by inoculations. It is stated by the local cultivators that the P.O.J. 2883 variety is highly susceptible and P.O.J. 2725 highly resistant to the disease. A table gives the results of varietal resistance experiments carried out in 1934. In pure culture the optimum temperature for growth of *C. taiwanensis* was between 25° and 28° C., with a maximum round about 34°.

The other two leaf spots discussed are the yellow spot or 'Rotfleckenkrankheit' due to *C. kopkei* [*R.A.M.*, xiv, pp. 81, 153], and eye spot, the causal organism of which is closely related to *Helminthosporium ocellum* [ibid., xiii, p. 654] in spore characters as well as in symptoms: in a table the Formosan eye spot fungus is compared with the descriptions of *H. ocellum* and *H. sacchari*, and it is concluded that it may be tentatively referred to the former until the identity of this species with *H. sacchari* is definitely settled [ibid., xiii, p. 12].

Unamuno (L. M.). **Notas micológicas. IX. Nueva aportación al estudio de los hongos microscópicos de Vizcaya.** [Mycological notes. IX. A new contribution to the study of the microscopic fungi of Biscay.]—*Bol. Soc. esp. Hist. nat.*, xxxiv, 10, pp. 513–528, 4 figs., 1934.

Continuing his geographical and taxonomic studies on the Spanish mycoflora [*R.A.M.*, xiii, pp. 183, 596], the writer gives an annotated list of fifty species (two new to science) collected in 1933 and 1934 in the province of Biscay, of which the following may be mentioned. *Phyllosticta aceris* [ibid., xiii, p. 596] was found on living leaves of *Acer campestre*; *P. paeoniae* on peony foliage (a new species for the country); *P.* (*Phoma*) *tabifica*, considered by Prillieux and Delacroix to be the pycnidial stage of *Sphaerella* [*Mycosphaerella*] *tabifica* [ibid., xiv, p. 282] on beet leaves, another new record for Spain; *Septoria alni* on alder (*Alnus glutinosa*) leaves (new to Spain); *S. passerinii* [ibid., xi, p. 745], characterized by filiform, hyaline, straight or slightly curved, pluriguttulate conidia, sometimes geniculate near one of the tapering extremities, 22 to 40 by 1·5 to 2·3 μ, on leaves of *Lolium italicum* (a new host for this fungus); *Macrosporium* [*Thyrospora*] *sarcinaeforme* [ibid., xiii, pp. 520, 548], a new species for Spain, on red clover (*Trifolium pratense*) foliage; and *Phaeoisariopsis* [*Isariopsis*] *griseola* on bean (*Phaseolus vulgaris*) leaves [ibid., xii, pp. 2, 680].

Roger (L.). **Quelques champignons exotiques nouveaux ou peu connus. I.** [Some new or little known exotic fungi. I.]—*Bull. Soc. mycol. Fr.*, l, 3–4, pp. 317–332, 9 figs., 1934.

This is a series of notes (including technical descriptions) on seven fungi collected in Africa. *Ragnhildiana manihotis* [*R.A.M.*, xi, p. 130] was found causing leaf spots on cassava (*Manihot utilissima*) on the

Ivory Coast; the amphigenous conidiophores emerge in tufts from the stomata, under which the fungus forms a loose stroma; they are olive-brown or brownish-yellow, simple, 1- to 6-septate, 50 to 200 by 3·5 to 5 μ, and slightly geniculate towards the tip; the conidia are hyaline, cylindrical or slightly clavate, 0- to 3-septate, disposed in chains, and measure 15 to 45 by 4 to 8 μ. Mention may also be made of *Irenina isertiae* [cf. ibid. vii, p. 743] on *Coffea canephora* from the Ivory Coast, *I. coffeae* n.sp. on *C. excelsa* from the French Cameroons, and *Nectria cacaoicola* n.sp. on cacao pods from the Ivory Coast, which is stated to be the perithecial stage of *Fusarium decemcellulare* found in close association with it on the pods. It is pointed out that the similar *Fusarium* found by Reinking and Wollenweber to give in culture the perithecia of *Calonectria rigidiuscula* [ibid., xiii, p. 594] was not on cacao but on another host (*Hibiscus sabdariffa* from Java) and it is considered that the name *F. decemcellulare* Brick should be restricted to the cacao *Fusarium*.

Chardon (C. E.) & Toro (R. A.). **Mycological explorations of Venezuela.** —*Monogr. Univ. Puerto Rico*, Ser. B, Phys. & Biol. Sci., 2, 353 pp., 33 pl. (1 col.), 1 graph, 1 map, 1934.

The present volume, a companion to the 'Mycological explorations of Colombia' (1930) [*R.A.M.*, x, p. 340], is based almost exclusively on material collected in 1930 and 1932, a fairly comprehensive study of which has been made with the assistance of various specialists on different groups of fungi. The survey comprises 667 species, of which 92 are new to science and furnished with Latin diagnoses. Each chapter on the various groups is followed by a bibliography, and indices of hosts and genera of fungi are appended to the volume.

Crossing the Cordillera de la Costa north of Maracay the writers found coffee infected by *Rosellinia* and a phloem necrosis [cf. ibid., xiii, p. 367] resembling the *Rosellinia* disease in its symptomatology. At an altitude above 1,200 m. in the mountains south of Trompillo, more or less heavy infection of coffee by *Stilbella* [*Omphalia*] *flavida* [ibid., xiv, p. 184] was observed. Other coffee parasites encountered were *Cercospora coffeicola* and *Corticium koleroga* [ibid., xiv, p. 164]. On the cacao plantations of Ocumare de la Costa nearly every tree was infected by *Irenopsis guianensis*, while much damage to the sprouts was caused by *Phytophthora* [? *palmivora*: ibid., xiv, p. 87].

Almost all the sugar-cane fields in Caracas were infected by the necrotic stage of mosaic [ibid., xiv, p. 123] and by *Leptosphaeria sacchari* [ibid., xiv, p. 57]. Mosaic was also prevalent in several districts on the older varieties and the newly imported B.H. 10 (12); P.O.J. 2725 and 2878, however, were flourishing. Dry top rot (*Plasmodiophora* [*Ligniera*] *vascularum*) [ibid., xii, p. 466] was widespread in a field of Cristalina cane, this being the first record of the disease in South America.

Bananas in the Manuare Valley, where they are interplanted with coffee, were found to be heavily infected by Panama disease (*Fusarium* [*oxysporum*] *cubense*), locally believed to be due to the influence of Halley's comet.

Anthracnose [*Gloeosporium ampelophagum*: ibid., viii, p. 636] is a limiting factor in viticulture during the wet season (June to November)

at Valencia. *Plasmopara viticola* attacked only a small proportion of the fruits.

'Mal di gomma' was observed on grapefruit and mandarins at Valencia [cf. ibid., iii, p. 523], and *Septobasidium alni* occurred on the twigs and leaves. Sour oranges in San Felipe suffered severe damage from scab [*Sporotrichum citri*].

KOCHMAN (J.). - **Przyczynek do znajomości flory głowni Polskich.** [Contribution to the knowledge of the Polish Ustilaginales.]—*Acta Soc. Bot. Polon.*, xi, Suppl., pp. 285–303, 3 pl., 5 graphs, 1934. [English summary.]

In this paper the author gives brief descriptions of, and notes on, some smuts which have been recently collected by him in Poland and which are apparently new records for that country, including *Entyloma cichorii* Wróblewski which was found on two chicory (*Cichorium intybus*) plants, on the leaves of which it formed scabby, vivid green (later brownish) spots, 0·5 to 2 mm. in diameter, frequently surrounded by a yellowish halo. The spores are greenish in mass, globose, broadly-elliptical or polygonal, frequently elongated at one or both ends and measure 9 to 15 by 12·5 μ.

LEONIAN (L. H.). **Identification of Phytophthora species.**—*Bull. W. Va agric. Exp. Sta.* 262, 36 pp., 1 pl., 5 figs., 1 diag., 1934. [Received March, 1935.]

After pointing out the difficulties inherent in the classification of the genus *Phytophthora*, and a brief discussion of the attempts previously made in this respect [cf. *R.A.M.*, x, p. 754], the author gives a summarized account of his cultural study of all the available species and varieties (representing a total of 100 pure cultures obtained from various sources) of the genus, with the exception of *P. infestans*, *P. thalictri*, and *P. phaseoli*, the differential characters (host relationships) of which have already been sufficiently established, and certain other incompletely described or unobtainable species which are probably of little taxonomic significance. In preliminary experiments it was found that a number of the cultures dissociated freely, this being particularly true of *P. parasitica* var. *rhei*, some ninety dissociants of which were included in the studies.

The variability tests were based on the behaviour of the cultures at five different temperatures (variations of which in the incubators used did not exceed two-tenths of one degree C.), and in five different concentrations of malachite green [ibid., ix, p. 809], one concentration of tartaric acid [ibid., ix, p. 206], and one of potassium carbonate. The ability of a given organism to produce sporangia, oogonia, and chlamydospores, either together or in different associations, was found to be a valuable taxonomic criterion, as was also the ability to produce sporangia when sterile mycelium is transferred from pea broth into distilled water. By combining the results of his experiments [which are shown in tables] with dependable data obtained by previous workers, the author compiles a key permitting of the identification of twenty-two species and varieties which are retained, not because they are believed to have a sound specific basis, but because they possess one or more constant characteristics by which they can be singled out from the rest

by using the key. The latter is based mainly on cultural characters, oospore dimensions being sparingly used. A number of former species have been merged together (e.g., *P. arecae*, *P. jatropha*, *P. meadii*, *P. melongena*, *P. parasitica*, *P. tabaci*, and certain others are all referred to *P. palmivora*) [cf. ibid., x, p. 754], and a few have been re-established in the preparation of the key. The author believes, however, that further studies will show that there are not more than three good species of *Phytophthora*, namely, *P. infestans*, *P. cactorum*, and *P. palmivora*.

GOTO (K.). **Sclerotium rolfsii Sacc. in perfect stage. II. Studies on Sclerotium rolfsii of foreign origin in comparison with some strains of Formosa.**—*J. Soc. trop. Agric. Taiwan*, v, pp. 374–382, 2 figs., 1933. [Received March, 1935.]

Further studies on thirty strains of *Sclerotium rolfsii* from foreign countries and Japanese localities other than Formosa, in comparison with seven from the latter island and with *S. delphinii* [*R.A.M.*, xiii, p. 273; xiv, p. 147] showed that many of the foreign strains fell into the previously described groups I and II, which may produce basidiospores, while the foreign strains belonging to group IV were infertile. Group IV (ii), comprising some of the Indian strains [ibid., xiv, p. 125] and three from Malaya, differs somewhat from the type of group IV mentioned in the earlier study, being closer in some respects to R 25 from Formosa. With one exception (which resembled *S. delphinii* and is included with the latter in a fifth group) all the thirteen American strains sent as *S. rolfsii* fell into groups I and II and produced *Corticium*-like hymenia, as also did one of the four Indian and both the two African strains. These strains, which appear to be referable to *S. rolfsii* proper, are evidently widespread all over the world, more especially in the tropical and warm-temperate regions, including Japan, China, the Philippines [ibid., xiv, p. 315], Malaya, India, Africa, southern Europe, and the southern United States.

PIRONE (P. P.). **An improved method for inducing spore fructification in certain species of Macrosporium.**—Abs. in *Phytopathology*, xxv, 1, pp. 31–32, 1935.

Profuse conidial formation by *Macrosporium carotae*, the agent of carrot leaf blight [*R.A.M.*, xii, p. 356, 496], was induced by air-drying plate cultures for 24 to 48 hours at 21° C. with a relative humidity of 30 to 40 per cent. The age of the cultures used ranged from 5 days to 4 weeks, and the media employed were carrot, maize meal, and potato-dextrose agars. Undried cultures of identical origin and age produced few or no conidia. A cellophane covering placed a few inches above the exposed plates obviated the risk of contamination during exposure, and the spores appeared 48 hours after the Petri dishes were recovered.

KUNKEL (L. O.). **Recent advances in studies on plant virus diseases.**—*Rep. Quebec Soc. Prot. Pl. 1932–1934*, pp. 23–33, 4 figs., 1934.

In this paper (read before the Quebec Society for the Protection of Plants) the author reviews and discusses recent work on plant virus

diseases with special reference to three of its aspects, viz., quantitative studies on the tobacco mosaic virus [*R.A.M.*, xii, p. 526; xiv, p. 198], the isolation of variant strains of this virus [ibid., xiii, p. 330; xiv, p. 61], and the insect transmission of virus diseases in general.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 1, pp. 4–5, 9–12, 1935.

Germany (Bremen). An Order of 20th November, 1934 (Fourth Potato Wart Control Order), enacts that in 1935, holdings of 1,000 sq. m. or under are to be planted exclusively with wart [*Synchytrium endobioticum*]-immune potato varieties authorized by the German Plant Protection Service. In exceptional circumstances a permit may be obtained from the local authorities (by professional potato-growers only) for the cultivation of the susceptible Erstling [Duke of York] variety [cf. *R.A.M.*, vi, p. 320].

Great Britain and Northern Ireland. The regulations relating to the importation of plants into Great Britain and Northern Ireland are summarized.

Legislative and administrative measures. Canada.—*Int. Bull. Pl. Prot.*, ix, 1, p. 16, 1935.

According to an announcement of the Canada Destructive Insect and Pest Act Advisory Board, dated 17th October, 1934, mushroom [*Psalliota campestris* and *P. arvensis*] spawn is to be exempt from the requirements of Regulation No. 1 (Foreign) of the Destructive Insect and Pest Act [cf. *R.A.M.*, iii, p. 239], so that the regulations governing importation permits, health certificates, and inspection on arrival no longer apply to this commodity.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements July-September 1934. Quarantine and other official announcements.—pp. 71–72, 79, 80–89, 1935.

On and after 1st October, 1934, the use of willow (*Salix*) withes in the packing of nursery stock destined for the United States from Europe and Canada (which imposes no restrictions on the entry of such material from Europe) is prohibited with a view to the exclusion of the watermark disease (*Bacterium salicis* and *Pseudomonas saliciperda*) [*R.A.M.*, xiii, p. 334].

A resolution taking effect on 15th September, 1934, prescribes, as a condition of entry into Cuba, the disinfection, by immersion for at least five minutes in a 1 in 3,000 solution of bichloride of mercury, of all tomato and pepper (*Capsicum* spp.) seeds to prevent the introduction of *Bact. vesicatorium* [ibid., xii, p. 555, and above, p. 344].

A summary is given of the plant quarantine import restrictions operative in Czecho-Slovakia.